Fire Survival Skill:

Who Plays with Matches?

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Most children develop a fascination and an interest in fire, and at an early point in childhood strive to achieve control over fire and to acquire fire skills. A first attempt to engage in fire behavior is often initiated by the children themselves, they either ask for parental permission to light matches or do it without permission or in defiance of explicit parental prohibition. When children light matches without parental approval and/or supervision they are engaged in fire-play. Unfortunately, fire-play often results in fires causing injury and property damage. The purpose of the present study is to investigate the prevalence of fire-play and fire-setting in a sample of young normal boys and to study fire-play in relation to the child's fire-skills and knowledge and in relation to the characteristics of the children and their environments.

Actuarial data show that fire is a major hazard for young children both as setters and as victims. "Children with matches" cause 9.7% of the total annual home fires in the country and 10% of the people-caused forest fires in California (California Division of Forestry, 1977), and a large percentage in other states (Folkman, 1972). Statistics of building fires showed an increase in the percentage of known-cause fires set by "children with matches", these were: 6.2% in 1955, 6.5% in 1960, 9.3% in 1965 and 10.8% in 1973 (Statistical Abstract of the U.S. 1973). In depth analyses of fire records showed even higher percentages: 50% of the residential fires in Bolingbrook, Illinois (reported by Fire Marshall William Peterson in the Youthful Fire Setter Workshop, 1978),

48% in Hayward, California (Fire Inspector Ray Walters, Personal Communication), and 23.5% of people caused forest fires in California were caused by children (Folkman & Taylor, 1972). Children also constitute 30% of the national fire deaths and 42% of the total home fire injuries. A retrospective study based on the records of the U.S. Army Institute of Surgical Research from 1964 to 1970 (Wilmore & Pruitt, 1972) showed that most of the children's fire accidents (N = 265) resulted from playing with matches or fire. Galdston (1974) who studied burn victims, noted that one third of the children who were themselves the immediate cause of burns played with matches, candles and lighters, agents which are commonly available in the home. Since many children are involved in fire-setting "children with matches" is a common category of cause of fire appearing in actuarial fire information tables.

Fire-setting behavior starts at a very early age: 12% of the children involved in setting fires in the Los Angeles Forest Area were under 5 years old and nearly 75% were under 10 (Folkman, 1966), and 71% of the children who set fires in all zones of the Riverside Ranger Unit were under 8 (Ferguson, 1969). The U. S. Consumer Product Safety Commission also noted that accidents caused by playing with matches are most common with children under 11 years of age. Children in this age group together with elderly people suffer the most severe burns associated with lighting matches. Hence, many children engage in hazardous fire behaviors and some do it before they are exposed to fire prevention programs within the school system. In addition, fire-setting information showed that boys have a disproportionately high representation in hazardous fire behaviors. They started 99% of the fires in the

Manhatten, Bronx and Staten Island area in 1933 - 1938 (Yarnell, 1940), 92% of all child-caused fires in the Los Angeles National Forest Area (Folkman, 1966), 92% in England and Wales (Nurcombe, 1964), and they constitute most of the fire-setters in fire studies (e.g. 92% in Lewis and Yarnell's study, 1951; 100% in Siegelman's study 1969). Normal boys were also reported to have higher interest in fire than girls (Block, Block & Folkman, 1976). Fire data concerning age and sex suggests the importance in studying fire behaviors of young boys, therefore, this group of children was selected to be the focus of the present study.

The interest in fire-setting from a theoretical point of view was stimulated by Freud's paper on "The acquisition of power over fire" (1932). In this paper Freud viewed fire-setting as a result of urethral - phallic fixated drives. Most of the early and several of the later fire studies were clinical case studies in the tradition of the psychoanalytic theory (e.g. Greenberg, 1966; Simmel, 1949; for a review of early literature see Lewis & Yarnell, 1951; for theoretical presentations see Bachelard, 1938; Grinstein, 1952). Later studies included mainly samples of children who were involved in fire-setting, and who in most cases had a variety of other developmental problems. These studies explained fire-setting by aggressive drive manifestations as well as by sexual drive manifestations. The first in this series of studies was conducted by Yarnell (1940). She studied children (N = 60) who were referred to observation wards in a psychiatric hospital. Yarnell's sample included adolescents who were referred primarily because of fire-setting and younger children who were referred for other antisocial behaviors

rather than fire-setting. Lewis and Yarnell's (1951) comprehensive study included detailed reviews of 1383 case records from the files of the National Board of Fire Underwriters, their study also involved children and preadolescents (N = 238) whose reports were written by fire marshalls and insurance investigators. The study emphasized aggressive drives in addition to libidinal drives. These results were further supported by Kaufman, Heims and Reiser's (1961) study of boys (N = 30) who set fires causing property damage or injury. The boys included in the study were referred to three institutions for treatment and they were found to express both aggressive and sexual drives. The stressed sexual drives, however, reflected oral fixations which are more primitive drive manifestations than the phallic fixations suggested by Freud. Fire-setters (N = 21) in Brisbane, Australia were also studied by Nurcombe (1964), they were referred to either a clinic or a hospital for therapy and showed a variety of neurotic and antisocial problems. Vandersall and Wiener (1970) studied fire-setters (N = 20) referred to psychiatric clinics . While only three were referred for therapy because of their fire-setting behavior most children experienced academic difficulties. Recidivists (N = 30) and non-recidivists (N = 22) fire-setters, aged 7 - 14, were the subjects of the study reported by Siegelman and Folkman (1971). Included were fire-setters from an area within 150 miles of San Francisco. Clincial reports of eight young fire-setters were analyzed by Rothstein (1963) and those of four adolescent fire-setters were reported by Macht and Mack (1968).

The above studies comprise the major body of literature on child

and youth fire-setting behaviors. The studies were very helpful in defining some of the characteristics of the child fire-setter, mainly those dealing with control over aggressive impulses, and as such formed the basis for generating the hypotheses of the present study. These studies, however, did not provide information as to the prevalence of fire-play and fire-setting of young normal boys who were not referred to treatment either for fire-setting or for other antisocial problems. The need to study normal children was emphasized by Folkman (1972) who claimed that most fires are not the result of pathological behavior. Studies of normal boys will provide essential information for theoretical analysis of the child fire-setting behavior and will aid in designing prevention measures, educational programs and instructions for parents. (The latter kind of instructions is totally absent from popular child-rearing guides). A pilot study in this direction was recently reported by Block, Block and Folkman (1976). This study included 47 children, 5 and 6 year olds, attending the Harold E. Jones Child Study Center of the University of California, Berkeley. Out of this sample two boys had been involved in agency-documented fire-play and 59.4% of the boys and 33.3% of the girls expressed interest in fire as reflected in requests to light matches or in playing with fire materials without permission. The present study provides an extension of the Block, Block and Folkman (1976) study to a larger sample and to fire-play in general whether or not it resulted in actual fire-setting.

Fire Behaviors

The studies of fire-setters provide information about the behavior

of the children at the time of the fire, mostly in terms of location, number of fires and responses to the fire. The young children studied by Yarnell (1940) liked to make fires in streets and vacant lots and eventually set fires in their own homes. The children studied by Siegelman and Folkman (1971) also started most of the fires away from home with other children, mostly siblings, present. Parents of repeater fire-setters in the study were away at the time of the fire more often than the parents of the non-repeaters. On the other hand, Lewis and Yarnell (1951) found that most fires (55%) set by boys (aged 5 and 6) were set either at the child's home or at the home of a stranger. Vandersall and Wiener (1970) found that children living in cities set fires in buildings while children living in suburbs set fires mainly in fields. Nurcombe (1964) reported that young children set fires mostly at home or nearby, but older children were more likely to set fires at a distance from the home. The two fire- setters in the Block, Block and Folkman (1976) study played with matches, one in the house and the other in a field. The above studies indicated that children set fires both in or outside their houses, without any clear preference for either location. Two factors were suggested in the literature to account for location - age and residential area.

As to the number of fires set by children Siegelman (1969) reported that in her sample 42% set one fire, 31% set two fires and 27% set three to five fires. Of the boys studied by Lewis and Yarnell (1951), 79% set one to five fires, 14% set five to ten fires and 7% set more than ten fires. None of the children aged 5 - 10 set more than ten fires. The

prevalence of fire-setting and the number of fires set by a sample of normal boys will be observed in the present study.

Yarnell (1940) reported that the young children she studied were filled with anxiety as soon as the flames started, they tried to stamp out the fire and when unsuccessful cried for help. Repeater fire-setters (Siegelman & Folkman, 1971) tended to report the fire to their parents less often than non-repeaters, some of the repeaters even denied being involved in the fire. Different kinds of reactions were reported by Kaufman, Heims and Reiser (1961) who noted that fire-setters frequently called attention to themselves by describing how everybody, especially the fire department "is invited to the fire". In the same line, Yarnell (1940) reported that adolescent fire- setters planned the fires, usually away from home, and showed little evidence of anxiety or regret. Once again, previous fire studies did not show a consistent pattern of children's fire behaviors.

Information regarding fire-setting behaviors of children is sketchy and incomplete. Detailed analysis of the fire-setting situation, the people present, and the reaction of the children to the fire, is often missing. Hence, it is hard to draw conclusions on children's fire-setting behaviors. Data is also scarce about the other side of the coin: fire skills which reflect the ability of children to light and handle fire carefully and to react appropriately in times of hazard. Most researchers did not investigate the level of fire skills demonstrated by the children as part of their study. An exception is the research conducted by Block, Block and Folkman (1976), who studied fire

skills and attitudes. The mothers interviewed in this study reported high interest in fire, especially for boys. Twenty-six percent of the parents of the total sample reported that neither parent had discussed fire or attempted to show their child how to use fire materials. The present study includes investigation of fire knowledge and skills of parents and children, and of fire behaviors of children including fire-play, fire-setting and fire experience.

Family background

Actuarial data indicated that lower-class children start more fires than children in upper or middle class (Folkman & Taylor, 1972). Studies of young fire-setters provide support for this finding. Siegelman (1969) who compared recidivists to non-recidivists young fire-setters found that the first group came from low socioeconomic backgrounds as measured by parental education, income and occupation. She reported that nearly 50% of the mothers and more than 50% of the fathers of the non-recidivists had at least college education compared with 25% and 33% of the recidivists fire-setters. Twice as many recidivist as non-recidivist families had income under $6000 per year, and fathers of recidivists were half as often represented among professional, technical and managerial occupations as non-recidivists.

Fire-setters were found not only to have deprived socio-economic backgrounds, but they were also reported to come from families with troubled interpersonal relationships. In Yarnell's (1940) study, a large number of adolescent fire-setters came from unhappy family backgrounds because of such factors as step parents or psychotic parents.

Several of the young fire-setters in the same study were reported to live in boarding homes. Kaufman, Heims and Reiser (1961) reported a large number of deserting, alcoholic, abusing and psychotic parents in family histories of the children they studied. Of the boys studied by Lewis and Yarnell (1951), 45% came from broken homes or were adopted or illegitimate. Siegelman (1969) found that parents of recidivist fire-setters showed lower levels of marital happiness compared to the non-recidivist sample. In his study of burn victims, Galdston (1974) noted that all the 24 boys, 6 years and older, who were burned by playing with fire came from homes in which there was significant amount of marital strife. Nurcombe (1964) found that fire-setters often came from disorganized families because of absence of the father, separation of the parents or severe psychopathology of the parents. He indicated that in only one case (out of 21) both marital partners were regarded as adequate, affectionate, mature, accepting and consistent and this case involved a child who was adopted late. Kanner (1957) also noted the disturbed family relationships in the cases of fire-setting he had seen and stressed that the disturbed relationships with the fathers was a traumatic factor. Troubled relationships with the father were reported by Vandersall and Wiener (1970) who found that a mature, effective and consistently available father was not present in the homes of any of the children studied and that in 50% of the cases the father was totally absent. About 50% of the fathers of recidivist fire-setters were also absent (Siegelman, 1969).

The above fire studies showed consistently that young fire- setters

tend to come from deprived family settings in terms of income, parental education, parental occupation and family interpersonal relationships. The present study attempts to relate fire-play and fire-setting behaviors to background information in a sample of normal boys. It is hypothesized that children involved in hazardous fire behaviors and fire-play will come from more deprived family background compared to children who are not involved in such behaviors.

Child characteristics

The early fire-setting studies showed cognitive deficiencies of the children involved. Later studies also showed that fire- setting in young children is frequently associated with learning disabilities. Yarnell (1940) found such disabilities in almost half of her sample. Most of the children studied by Kaufman, Heims and Reiser (1961) had major school difficulties: only 8 out of the 30 children studied were at grade level. Twelve out of the 20 children studied by Vandersall and Wiener (1970) experienced academic difficulties. Most of children examined in previous studies had other developmental problems beside fire-setting. It is yet unknown whether the cognitive/academic problems demonstrated by children in these studies will be found for a sample of normal children. However, the present study will test the relations between fire behaviors and a variety of cognitive and knowledge variables in an attempt to test the hypothesis that fire-setting is negatively related to the child's level of cognitive development. Lack of proof of the research hypothesis may support Lewis and Yarnell's (1951) conclusion that defective intelligence is not an important factor for

fire-setting under the age of 16.

As early as 1853 Bischoff noted that children under 5 may play with fire for mischief (Lewis & Yarnell, 1951). Later, Scott (1974) suggested that fire-setters are children suffering from "conduct disorders" involving anti-social disturbances rather than neurotic problems. Studies of fire-setters supported these observations: Yarnell (1940) found that young fire-setters showed other types of antisocial behavior such as running away from home, truancy, stealing and general hyperkinesis and aggression. Engaging in aggressive behaviors such as stealing and running away from home was also reported by Nurcombe (1964), Rothstein (1963) and Lewis and Yarnell (1951) for children and preadolescent fire-setters. In the same line, Kaufman, Heims and Reiser (1961) reported that a high percentage of their sample of young fire-setters showed severe rage reactions and chronic hyperactivity. Children who play with matches, resulting in burn injuries, were also reported to be highly mischievous by Wilmore & Pruitt (1972). Nurcombe (1964) also found that fire-setting co-exists with a variety of antisocial phenomena, and is one example of expression of aggression. He reported that fire-setting was combined with stealing, sadistic behavior to young siblings and hyperactivity. Recidivists fire-setters were described as more impulsive and displaying anger with accompanying destructiveness when compared with non-recidivists (Siegelman & Folkman, 1971). In a Japanese study (Sakamoto, 1960 - reported by Hellman & Blackman, 1966) fire-setting was found to be an integral trait in children who show other aggressive, acting-out and delinquent behaviors. Fire-setting in

childhood was found as a predictor for aggressive crimes in adulthood for a sample of 84 prisoners (Hellman & Blackman, 1966). In their sample of normal children, Block and Block (1975) found that children who demonstrated low level of caution in dealing with fire were described as less responsible and self controlled and more mischievous and impulsive than their more cautious peers. As indicated earlier, while the early fire studies focused on libidinal drives, later studies shifted the focus to aggressive drives emphasized in most of the studies reported above. The consistent association between fire and hyperactivity and aggression was previously explained by inability to control impulses and energies leading to attempts to discharge the tension by externally directed activities. Ego disturbances emerging from difficulty to control instinctual drives were assumed to affect children's involvement in all kinds of mischievous behaviors, fire-setting being one of them.

If fire-setting is to be viewed as one expression of aggressive drives, mischievous children could be predicted to be involved in a variety of other kinds of accidents resulting from adventurous play. The literature dealing with childhood accidents seems to support this conjecture. One of the most extensive studies in this area was reported by Manheimer and Mellinger (1967). They studied 684 children in Berkeley - Oakland, California and compared the characteristics of children with high, intermediate and low accident rates. They found significant relations between accident liability and activity, showing-off, aggression, exploration, daring and rough-housing which are all "mischievous" traits leading to high hazard exposure of children having these traits.

In addition they found relations between accident liability and traits such as impulsivity, carelessness, risk-taking, low frustration tolerance and unreliability, all traits which impair the ability of the children to cope with hazards. Manheimer and Mellinger cited earlier studies supporting their results. They also reported that high-accident boys show personal and social maladjustment and have more discipline and school problems. Similarly, Finlayson (1972) found that boys who showed relatively unsafe road behaviors were more excitable, demanding, tense, frustrated, dominant, over-confident and assertive relative to other boys. Hence, the characteristics of children involved in accidents are similar to the ones of fire-setters. These two areas of investigation showed that high activity level combined with a difficulty to control drives and to adjust one's behavior to cope with hazards is related to adventurous behaviors resulting in accidents.

Ego disturbances suggested for children who are involved in fire-settings and accidents are closely related to the concept of ego control (Block & Block, 1975). This concept relates to the ability to control one's impulses and desires. Ego undercontrollers are comparatively spontaneous, impulsive and unable to delay gratification. They are predicted to be more often involved in adventurous risk taking play, including fire-play. On the other hand, ego overcontrollers are constrained, delay gratification unduly, indecisive, cautious and less comfortable in new situations, they are predicted to be more cautious and risk avoiding, and hence, to be involved less often in fire-play. A concept which is related to ego or impulse control is the concept of ego

resiliency (Block & Block, 1975). It reflects the ability of an individual to modify the level of ego control in accordance with the demands of the specific situation. Ego resilient individuals are able to adopt resourcefully to changing circumstances and environmental contingencies: whereas ego brittle or unresilient individuals have little adaptive flexibility and tend to "fragment" under stress. Ego unresilient children are predicted to be unable to adapt themselves to the safety demands of risky situations, to be more often involved in hazardous fire-play and to be unable to cope with hazards once they occur.

The above discussion suggests that fire-play is not an isolated problem but rather one which characterizes highly active children who also engage in other kinds of antisocial behaviors. Hence, another hypothesis to be tested in the study is that children who are involved in fire-play or fire-setting are active children who are also involved in other kinds of mischievous behaviors and accidents. Information about the child's activity level, health and accident history and frequency of engaging in mischievous behaviors were collected in order to test this prediction. In addition to general activity level the inability to control impulse is predicted to be related to risky fire behaviors, two components of ego control were studied: the ability to delay gratification and the ability to tolerate frustration. Ego resiliency is also predicted to be a fire behavior correlate, two components of ego resiliency were studied: the ability to control tempo and the ability to profit from feedback. In summary, the personality variables suggested as fire behavior correlates are general activity level, ego control and

ego resiliency.

Several studies suggested that the relations between fire-setting and aggression portray only part of the picture. Siegelman and Folkman (1971) presented two types of fire-setters, one characterized as restless, antisocial and anger expressing children and another type characterized as anxious, withdrawn, and expressing anger against themselves. Both types showed hyperactivity and difficulty in peer relationships. As noted by Siegelman (1969) only five boys were classified as the second type (out of 14 boys who set between three to five fires). Vandersall and Wiener (1970) identified three types of personality among fire-setters: one which is infantile, impulsive and deviant (N = 9), another which is more controlled and compulsive (N = 8) and a third which included sophisticated, independent and assertive children who cope successfully with the environment. Typologies of fire-setters were also presented by clinicians in an attempt to relate them to mental illness (e.g. Rothstein, 1963). Nurcombe (1964) presented eight diagnostic categories into which his 21 subjects were assigned. Typologies of fire-setters are crucially important when intervention procedures or therapeutic methods are sought. For this purpose, clinical psychologists separate fire-setters into several groups: normal, slightly disturbed, moderately disturbed and psychotic. It seems that a systematic typology of the child fire-setter and research supporting such a typology are still missing. The sample selected and the methodological strategies chosen for the present study are not appropriate for identifying and testing typologies of fire-setters nor was this an objective of the

present study.

The child's interpersonal characteristics were also found to be correlates of fire-setting (Siegelman, 1969). These characteristics included mainly the quality of relationships with parents and peers. Interpersonal relationships as correlates of fire behaviors were also tested in the study. Interpersonal relationships were assessed in this study by parental reports and were also observed by the interviewer in a fire experiment requiring parent-child interaction.

Summary of objectives

This study had three general objectives.

1. Investigation of fire behaviors and fire knowledge

The first objective of the study was a description of fire variables for a random sample of young normal boys and their parents. The description included a survey of the level of fire knowledge of both parents and children as well as of fire prevention measures taken by the parents. It also included information about fire behaviors of the boys; fire behaviors included both positive aspects such as fire skills and competence and negative aspects, namely fire-play and fire-setting. Detailed information was collected about the fires experienced by the family members and especially by the sampled boys. Information about the fire variables was gathered via fire knowledge tests , reports of parents and children, and observations of fire behavior in a fire experiment.

2. Study of relations between fire behaviors and family background

Clarifying the relations between fire behaviors, mainly fire-play

and fire- setting and family background was the second general objective of the study. It is predicted that boys who are involved in negative fire behaviors will come from more deprived family backgrounds relative to their peers. Family background was depicted by the following variables: parents' marital status, education, occupation, income, residential area, standard of housing, race, number of children in the family, ages of children and parents' perceptions of family relationships.

3. Study of relations between fire behaviors and child characteristics

The third general objective of the study was to examine the relations between fire behaviors, mainly fire-play and fire-setting, and the characteristics of the child. The characteristics of the child included several areas of interest; Cognitive and knowledge variables which were previously found to be negatively related to fire-setting, and three major personality characteristics predicted to be related to fire behavior: general activity level, ego control and ego resiliency. These variables were assessed by objective measures as well as by parents' and interviewers' evaluations of the child. Several interpersonal factors were also tested as fire behavior correlates. They included variables pertaining to the quality of relationships with parents and peers, and were assessed by parents and interviewers.

METHOD

Subjects

Ninety-nine boys randomly sampled from the Berkeley Unified School District participated in the study. The boys represented 19 schools,

they were enrolled in kindergarten (N = 33, mean age 5.9), second grade (N = 33, mean age 7.9) or fourth grade (N = 33, mean age 9.9). The parents of the boys were contacted initially by telephone. From a total of 329 attempted contacts, 22% resulted in no answer, 48% refused to participate (some of the refusals can be explained by the fact that most of the interviewing was conducted during summer vacation) and 30% actually participated in the study (38% of the calls answered). Of the participating boys, 67% were white, 22% were black, 6% were oriental and the others were of indian or spanish origin. In order to test the racial representation of the sample, the race of the population of boys in the three sampled grade levels was analyzed. Results of this analysis indicated an over-representation of whites in the sample: 67% versus 48% in the population, and under-representation of blacks: 22% in the sample versus 40% in the population of boys. Analysis of the refusals showed that whites were only 40% of the refusals though they comprised 50% of the calls responded.

Procedure

Parents and children were interviewed in their homes by female interviewers. Both parents were then asked to complete a questionnaire.

Interview with the parents

Parents (mostly mothers) participated in a structured interview. The interview included the following information:

1. Background information - Information about the family, including marital status, age and number of children, parents' age, occupation , education, race, income, residential area, standard of housing and percep-

tion of family relationships.

2. Child's health and accident history - The parent was asked to indicate whether the child had any health problems (birth, seeing, hearing, respiration, weight, hay fever, allergies, frequent colds, pains) or any accident or behavioral problems (major burns, minor burns, cuts, bruises, broken limbs, swallowing toxic liquids, temper tantrums, nightmares, getting lost, wetting bed after age four, any other behavioral problems). The parent was also asked to give details about each kind of problem occurring in the child's past or present.

3. Child's personality characteristics - The parent was asked to evaluate a number of personality characteristics of the child. The frequencies of ten behaviors (getting angry, exploring, rushing into things, daring, hurting self, being physically hyperactive, being inconsiderate, being withdrawn, finishing a task, being stubborn) were evaluated on 7-point scales. Ten additional behaviors were evaluated by yes-no answers (understanding results of actions, wanting rewards right away, being physically coordinated, feeling that everything is under his control, confusing reality with imagination, getting easily tired, being obedient, being careful enough to play without supervision, being impatient, having high level of intellectual ability).

4. Child's daily activities - The parent was asked to estimate the amount of time the child spent daily performing a list of activities (reading or looking at books, drawing or writing, doing homework, playing with toys, playing with animals, playing with games, watching television, napping, engaging in physical activity, engaging in fantasy play,

playing an instrument, playing outdoors). In addition the parent estimated the time that the child spent daily with a number of people (mother, father, siblings, the whole family, friends, babysitter, alone).

5. Child's knowledge of different survival skills - The parent indicated whether or not the child could use 30 household instruments, and the way he learned about them. The parent was also asked whether the child could perform 30 household activities on his own. In addition, the parent was asked whether she discussed 15 hazardous situations with the child.

6. Fire behaviors, knowledge and skills - The parent described in detail all the fires involving the family members, and especially any fires set by the child. In addition, the parent was asked to describe all incidents of fire-play inyolving the child, the child's interest in fire, the way the parent handled this interest and the most important thing he/she wanted to teach the child about fire. Seven fire behaviors of the child (fear, competence, avoidance, attraction, caution, desire to play with fire, desire to light matches) were rated on 7-point frequency scales. Frequency of use of a number of fire materials (e.g., gas for cooking, cigarettes, fireplace, candles) was estimated by the parent and the involvement of the child with each of them was assessed. The fire skills of the child were assessed during the fire experiment.

7. Home fire checklist - A 20 item checklist involving home safety measures was completed by the parent and the interviewer.

Parent questionnaire

Both parents were asked to complete a questionnaire which included the following information:

1. Child's personality characteristics - Further information about the personality of the child as perceived by both parents was collected. The questionnaire included evaluations of the child's activity level, impulsivity (measured by 12 questions taken from Sutton-Smith & Rosenberg's (1959) impulsivity scale), evaluations of the frequency in which the child was involved in 20 mischievous behaviors (including moral, physical and social mischief), frequency of the parents use of 16 punishment methods (including physical, verbal, taking away privileges and love withdrawal) and evaluations of the child on 40 (behavioral, affective and social) adjectives according to the degree to which they are typical representations of the child. The parents also evaluated the relationships between themselves and their sons, and between their sons and other children.

2. Information about the family - Both parents evaluated themselves and their spouses on the same 40 adjectives used for the description of the child. The parents also evaluated the quality of the relationships in the family on several 7-point scale items.

3. Fire knowledge and skills - Questionnaires designed to measure fire knowledge and skills of the parents were also administered. They included questions about fire situations, about preparation for coping with fire situations and about consequences of fires.

Interview with the child

I. Cognative, knowledge and personality variables

The interview with the child consisted of a number of measures designed to test the child's level of cognitive development, knowledge and personality variables. The cognitive and knowledge measures included digit span as a measure of short term memory, comprehension to assess verbal intelligence, picture arrangement as a measure of the ability to understand causality and mazes as a test of foresight and planning. The measures of personality included the actometer as a general activity measure; two measures of aspects of ego control: the balloon test indicating the ability to delay gratification and the puzzle test indicating the ability to tolerate frustration; and two measures of aspects of ego resiliency: the block tower test which indicates the ability to profit from feedback and the draw-a-line test indicating the ability to control tempo.

1. Digit span (WISC) - A measure of the child's ability to remember and repeat series of digits forward and backward. Split-half reliability of this measure was reported to be .60 for age 7.5 and .59 for age 10.5 (Wechsler, 1949). The total score of this test was the sum of the maximum number of digits remembered correctly.

2. Comprehension (WPPSI) - An assessment of the child's ability to make judgements about social situations. Three out of the 15 items involved fire situations ("why shouldn't you play with matches?", "why is it better to light a room with electric light than with candles?" and "why is it better to build a house of brick than of wood").

The average test-retest reliability of the scale was .83 (Wechsler,

1967). The total score of this test was the sum of scores of individual items (0 - 2 for each item).

3. Picture arrangement - A measure of the ability of the child to rearrange a set of pictures so that they relate a sequential story indicating causality. Two of the picture sets were taken from the WISC: "fire" and "picnic". Additional five sets were taken from Block and Block (1976). Each series of pictures was scored for correct-incorrect response and for the time required for completion. The total score consisted of the number of correct responses.

4. Mazes (WISC) - A test requiring the child to find his way out of several mazes of increasing complexity. Each maze was scored for the number of errors and the time required for solution. Split-half reliability of this test was reported by Wechsler (1949) to be .79 for age 7.5 and .81 for age 10.5. This test may also indicate the child's ability to control his actions based on planning, since each move of the pencil should be done while considering future moves. The total score was the number of errors for all mazes.

5. Block tower test - A measure of the child's ability to profit from feedback. The test involved four estimates of the height of a block tower that the child expects to build with a total of 20 available blocks, and four measures of the actual tower the boy built. The sum of the absolute differences between the expected values and the actual values of the towers was the total score. The score reflects the alignment of the child's aspiration with the reality of his performance.

6. Draw-a-line - A measure of the child's ability to modify his tempo.

The child was asked to draw a 6 inch line at his normal speed, and then to draw a line of the same length as slowly as he could. The score was the difference between the time required for drawing the two lines. This test was presented by Maccoby, Dowley, Hagen and Degerman (1965) who found its test-retest reliability to be .77 for a sample of 10 children. They reported the measure to be related positively to Stanford-Binet IQ ($r = .44$, $p<.01$). A similar measure of motor inhibition was found to separate significantly between 9 and 11 year olds normal and abnormal children (Davis, 1969).

7. Puzzle Test - A measure of the child's persistence under frustration: The child was asked to solve a very difficult puzzle and his behavior was observed for five minutes. The score indicated whether the child did or did not work on the puzzle for the time alloted.

8. Balloon test - A measure of the child's ability to delay gratification. The child was asked to choose between a 12" balloon received immediately or a 24" balloon to be received after one week. The measure is based on the idea for behavioral measure of delayed gratification suggested by Mischell (1961) who used "candy bars" instead of balloons.

9. Actometer - A behavioral measure of the child's amount of physical movement during the interview: movement was assessed by two actometers, one attached to the child's non- preferred arm and one to his ankle. Movement was assessed relative to the time of the interview. The actometer was developed as a measurement device by Schulman and Reisman (1959). Its test-retest reliability was assessed by Maccoby, Dowley, Hagen and Degerman (1965) and was found to be very low (.31 for arm

measurement and .22 for leg measurement) for a sample of 15 preschool boys.

II. Fire knowledge, behaviors and skills

Fire knowledge was assessed by a number of specially designed tests, fire behaviors and skills were assessed by reports of both children and parents as well as by the performance during the fire experiment.

1. Things that burn - A test designed to assess the child's knowledge about burnables and non-burnables. The child was given a box which included 22 everyday items (card, plastic spoon, piece of wool, peanut, paper clip, hair clip, plastic comb, chalk, glass bottle, pencil, piece of cloth, wood, rubber band, metal key, stone, aluminum foil, eraser, metal key chain, plastic key holder, plastic button, wooden button, metal button) and was asked to put them into two separate piles; one including things that burn and the other things that do not burn. The number of correct allocations was the total score for this test.

2. Identification and function understanding of fire items - Seven cards depicting pictures of fire items were presented to the child (firefighter, fire extinguisher, fire hydrant, smoke detector, alarm box, fire engine, Smokey Bear). The child was asked to identify each item by its name and to describe its function. Two total scores were computed for each question (name and function).

3. Knowledge about fire situations - The child was instructed to "show me" the correct behavior for seven fire situations (finding matches at school, smelling smoke in the room, seeing flames coming out of the

toaster, child's clothes catching fire, burning one's hand, seeing flames in the room, seeing flames at night). The total score was the number of correct responses.

4. Fire questions - The child was asked about his experience with fire ("did you ever see a fire?", "did you ever play with matches?", "what else can you tell me about fire?").

Fire experiment

The fire experiment was a modification of one procedure used by Block and Block (1975) to evaluate maternal teaching strategies when instructing the child about fire materials. In the present study, the parent was asked to teach the child to boil water on a butane camping stove (Gaz International, Model 5200) using a small Pyrex Coffee pot and safety matches. The parent was given three alternatives: the first was not performing the task, the second was performing the task as a demonstration and the third alternative was letting the child perform the task. The parent was asked to use any teaching method she chose. The teaching session was tape-recorded and also evaluated by the interviewers. The evaluations were performed on four variables: mother's support, level of responsibility allowed by mother, mother's clarity of explanation and child's competence level. These evaluations were made on 7-point scales with detailed anchors for each point. For comparison purposes the parent was also asked to teach the child to sew a button on a piece of cloth.

Interviewer evaluations

In addition to evaluating the fire and the button sewing experi-

ments, the interviewers also evaluated the boys on the same 40 adjectives used for parents evaluations. The interviewers also answered a number of open-ended questions designed to represent their perceptions of the situation. The interviewers also recorded any adjective used spontaneously by the parent to describe the child.

RESULTS

The first section of the results presents the analyses of the fire variables including behaviors, knowledge and skills for the sample as a whole. The other sections present comparisons between groups. Four groups of boys were identified: 1. boys who set fires, 2. boys who played with matches, 3. boys who never played with matches but were allowed to light them under parental supervision, and 4. boys who never lit matches prior to the fire experiment. Since playing with matches was perceived to be of crucial importance the focal analysis involved the comparison between boys who played with matches and those who were not involved in matches-play (groups 1 and 2 versus groups 3 and 4). Secondary analysis involved two kinds of comparisons: fire-setters versus matches-players (group 1 versus group 2) and boys who are allowed to light matches versus boys who never lit matches (group 3 versus group 4).

I. Fire behaviors, knowledge and skills

Of the boys interviewed , 45% were involved in fire-play 47% of these boys (21% of the total sample) set a total of 33 fires. One fire resulted in serious damage to the house and ten fires resulted in damage to various household items (e.g. rug, mattress, toy, kitchen floor). A

close inspection of the fires set by children revealed that 32 fires were set by playing with matches and one fire was set by playing with a magnifying glass in the sun. Over half (52%) of the fires were set by the boys in the presence of their friends or siblings. Eighty-four percent of the fires were set by children between the ages 5 and 7. The locations of the fires indicate that most of them were set in places where they could not be easily detected by adults: 39% in a yard or field and 52% in places such as bedroom (in a closet, under the bed), bathroom, garage, tool shed and basement. Almost half of the fires (48%) were put out by the children and their friends, 49% were put out with the aid of an adult, in most cases the mother, and one was extinguished by the fire department. The fire department was notified about two more fires (one mother called the fire department because she felt helpless about the child's fire-setting behavior and hoped that fire specialists would be able to better educate her son in fire prevention. Another mother called "Parental Stress" unit after the fire). Hence, the fire department was notified about 9% of the total fires.

In addition, several boys were present in 19 home fires set by other members of the family, the parents also reported 37 fires not involving the boys. Thus, a total of 89 fires were reported by the 99 boys and their parents. Of these additional fires, 15% were set by a family member playing with matches and 16% were caused by fire crackers, lighters, or cigarettes. The other fires were set by cooking equipment and appliances. The fire department was notified about 33% of these fires and actually put out 26% of them. Five of the 56 fires resulted

in injuries involving different degrees of burns. Four parents reported that their whole house was destroyed, six more parents reported serious damage to a part of the house, and five parents reported forest or bush fires.

When asked about burn injuries of their interviewed sons, 30% of the parents reported such injuries, 83% of them were minor burns and 17% were major burns requiring medical attention. Fifty percent of the burns were caused by touching a hot object (oven, toaster, heater), 20% were caused by playing with matches or fire crackers, 10% were caused by spilling hot liquids, the other burns were accidents involving candles, stoves or steam.

Analysis of the children's fire-plays revealed that 50% did it only once, 33% of these plays resulted in a fire. Of the boys who played with matches, 34% have done it many times and most of them still do it occasionally; 81% of these boys set at least one fire. When the boys were asked about their fire play, 85% of the boys who played with fire admitted doing it and 25% of the boys who had not played with fire reported some kind of fire-play performed by either their friends or their siblings. The latter result suggests that the prevalence of fire-play may be underestimated, since some of the children who reported fire-play by others may have been involved in it themselves. When asked about fire interest of their children, 82% of the mothers reported some form of interest expressed by their children through fire-play, talking about fire or watching fire. Thirty-six percent of the mothers of the "interested" boys reported that they handled the interest by warning or forbidding

the child to use any kind of fire and 2% by ignoring the problem. When asked about the main thing that their sons should know about fire, 68% of the mothers mentioned the danger involved in it. In addition, 44% of the mothers mentioned fire as their major worry when leaving children alone in the house.

The mothers were also asked to describe on 7-point scales the frequency with which the boys demonstrated different kinds of fire behaviors. The mean values and the intercorrelations of these evaluations are presented in Table 1. The results indicated that fear and avoidance of fire situations are the rarest behaviors; they occurred, on the average, only once (this was the anchor for level "2"). The frequencies of occurrence of these two behaviors were significantly correlated ($r = .21$, $p<.05$). On the average, desire to play with fire and desire to light matches occurred rarely, while fire attraction occurred "sometimes" (this was the anchor used on the frequency scale for level "4"). Desire to play with fire, desire to light matches and attraction to fire were highly intercorrelated ($p<.05$). The frequency of caution and competence were also significantly correlated for the total sample ($r = .32$, $p<.05$). Competence was the only fire behavior significantly related to age ($r = .26$, $p<.05$). Neither caution nor competence showed high frequency of occurrence. Attraction, avoidance and competence are three fire behaviors which are generally independent.

Fire knowledge

1. Things that burn

The boys sorted a group of items into two categories: things that burn and things that do not burn. The results indicated that on the average 89% of the "obvious" burnable items (paper, cloth, wool, peanut, wooden objects) and 91% of the "obvious" non-burnable items (stone, glass, metal objects) were sorted correctly. However, for the more difficult items correct sorting was performed for only 50% of the burnables (plastic and rubber items) and for 57% of the non-burnables (aluminum and chalk).

A total score (number of correct allocations) was computed for each individual, it correlated significantly ($p<.05$) with the other fire knowledge indices, with the cognitive measures and with age (Table 2).

2. Identification and function understanding of fire items

All 99 boys identified a picture of the fire fighter and knew that his work was to "put out fires". Ninety-five percent of the boys identified the fire engine and 98% knew its function. Smokey the Bear was named by 95% and his relations to forest fire was mentioned by 91% of the boys. A high level of knowledge about the function of fire extinguisher (91%) and fire hydrant (97%) was also demonstrated by the children though a lower percentage was able to name them correctly (70% and 71% respectively). The hardest items to identify were smoke detector (46%) and alarm box (49%), their functions were understood by 72% and 69% respectively.

Two scores were computed for each individual: one was the number of correct namings, and the other was the number of functions correctly understood. The two scores correlated highly with each other (.61, $p<.05$)

as well as with the other fire knowledge indices, with the cognitive measures and with age (Table 2).

3. Knowledge about fire situations

Seventy-nine percent of the boys knew that matches found at school should be given to an adult and 64% knew that water is the immediate treatment for a burnt hand. Sixty-three percent knew that in case of a night fire - the best thing to do is to wake their parents, 57% reported that in case of a day fire they will get out of the house, and 41% said they will tell their parents about flames coming out of the toaster. (23% said they would put water on it). The "Stop - drop - roll" rule was either reported or performed by 60% of the boys when asked about a situation in which their clothes caught fire. Only 35%, however, knew that crawling is the best response in case of smoke in the room (the other indicated running, calling fire department, and telling parents). Overall, 57% of the responses were correct. The younger age group had 36% correct responses, while on average the older age groups had 65% and 67% correct responses respectively.

The total number of correct responses was computed for each boy. The total score correlated positively and significantly ($p<.05$) with the other fire knowledge indices, with the cognitive measures and with age (Table 2).

Fire skills: The fire experiment

Of the total sample 71% of the children lit matches during the fire experiment (48%, 85% and 79% for the three age groups), 42% were reasonably competent (able to light matches with parental help) in dealing

with them , but only 7 children were able to conduct the experiment as a whole on their own. Forty-five percent of those who did not light matches were forbidden to do so by their mothers (three mothers elected not to perform the experiment at all), the others refused to do it mostly because of a fear of fire. None of the children who set fires refused to light matches in the experiment, however, 25% of their mothers forbade it. In comparison to the 71% of the children who used matches in the fire experiment, 92% of the boys used the needle in the button sewing experiment, thus demonstrating that the lower percentage of children who lit matches is not a problem of physical competence.

The evaluations of the interviewers are presented in Table 3. The data indicate that the child's competence and degree of responsibility allowed by mother were positively related to age, while the degree of detailed and clear explanation was negatively related to age ($p<.05$). The amount of support provided by the mother was not related either to age or to level of competence. The amount of support was very consistent across the two experimental tasks ($r = .80$), somewhat less consistent were the level of responsibility ($r = .55$) and the amount of detail in the explanations ($r = .61$), the level of the child's competence was the least consistent between the two tasks ($r = .32$). The mean values of the two tasks also showed significant differences in three of the four evaluations: Parents provided more support and allowed more responsibility in the button sewing task, and the children showed higher level of competence in it relative to the fire task ($p<.01$).

Fire skills and experience of children

During the interview the parents were asked to indicate whether their sons could use 30 household instruments, many of these instruments involved the use of fire and electricity. On the average the children in the study could use 19.6 of the instruments (14.3, 20.2 and 24.1 for the three age groups). These instruments included: lighter (used by 23% of the children), television (99%), toaster (75%), stove (55%), oven (28%) and iron (15%). Examples of other instruments not involving electricity were scissors (99%), hammer (95%), seatbelt (79%), sharp knife (77%), watch (65%), compass (50%) and road map (50%). As for the involvement of the child in a number of fire behaviors at the home (e.g., lighting cigarettes, candles, fireplace), the list contained 15 items and children were involved in 5 on the average. In addition, in response to the question about communicating to the child 15 different hazard situations, most parents reported that they had discussed the dangers with their children (e.g., matches, accidents, toxic liquids, drugs, high places, sharp objects).

Fire knowledge and skills of parents

Response to questionnaires designed to assess parental fire knowledge and skills were analyzed; both mothers (N = 73) and fathers (N = 33) responded to the questionnaires.

The telephone number of the nearest fire department was known by 22% of the mothers and 13% of the fathers. Sixty-six percent of mothers and 97% of fathers knew how to operate a fire extinguisher, but only 63% of the households had one. Only 6% of the parents had a fire extinguisher in the car, 30% of mothers reported to have a smoke detector in

the house and 12% of the mothers that they had an escape ladder. Eighty-nine percent of mothers and 97% of fathers thought about fire escape plans, 55% (58% fathers) discussed it with their family members, but only 5% (6% fathers) actually conducted a home fire escape drill and 3% had practiced it and met in a pre-arranged assembly place. Deficiencies were also found in dealing with child-related fire problems; only 65% of mothers (38% of fathers) checked children's clothing for fire-retardant labels, 51% of mothers (44% of fathers) instructed babysitters about fire behavior, and 24% of mothers (29% of fathers) left their small children alone.

Over 80% of the parents knew that carbon monoxide impairs judgment, that water and electricity combined cause shock, that paint thinner is flammable and that gasoline should be stored in metal containers. Forty-three percent of mothers (40% of fathers) thought that flour is an effective fire extinguishing agent, 25% of the parents did not know that perfume and deodorants are highly flammable, 30% did not know that cotton is more flammable than wool.

Most parents (over 80%) knew the "stop - drop - roll" rule, that hot doors should not be opened when smoke comes through them, that crawling is the best practice for avoiding smoke poisoning, that jumping from a fifth-floor is highly hazardous and that water should not be used for electrical fires. Twenty-eight percent of mothers (26% of fathers) indicated that they would re-enter a burning building to save documents.

The questionnaires indicated that parental knowledge, though far from being complete is at a reasonable level, their fire skills and

preparations, however, leave much to be desired.

A home fire check-list was completed by the interviewers. Results indicated that although most parents were aware of fire hazards, several deficiencies still existed: about 10% of the interviewed families had furniture and other burnables close to stoves, heaters, or fireplaces, overloaded electrical outlets , electrical cords hung on nails, or gasoline used for cleaning. An even higher percentage of households (range 18% - 29%) stored paper in garage or basement, collected rubbish around the home or had ashtrays near beds. Out of the 20 checklist items, the families had, on the average, 3 deficient items.

II. Who are the boys who played with matches?

The boys who played with matches at least once ("play" group, N = 45) were compared to those who were never involved in fire-play ("non-play" group, N = 54) on family background variables as well as on the characteristics of the child.

Family background

The boys who played with matches tended to live with both their biological parents less often than the boys who did not play with matches (44% versus 70%, $p<.05$). The boys who played with matches lived more often with their unmarried mother (7% versus 2%), with their mother and her spouse (9% versus 2%), with their mother and her unwedded friend (11% versus 2%) or with their adopted family (9% versus 0%).

The children who played with matches differed from the children who did not play with matches in level of education of both the women and

the men residing with them. On the average, the mothers of the first group had a diploma or partial college education, while the mothers of the second group had a B.A. ($p<.02$). The same difference (though at higher mean values) was found for the mothers' spouses ($p<.06$).

Analysis of the parents' occupation showed that the groups did not differ significantly according to the profession of the mother: 33% of the mothers of the boys who played with matches had manual or low clerical positions, 31% were homemakers and 36% worked in professional or semi- professional occupations, the respective percentages for the "non-play" group were 15%, 46% and 39%. The groups differed, however, on the occupations of the men living with the boy ($p<.05$), 39% in the "play" group were unemployed, retired or held manual or low clerical occupations, while only 13% of the "non-play" group held such positions. All four unemployed men were in the "play" group, and 15 out of 17 professors, attorneys and physicians were in the "non-play" group.

Analysis of the children's race revealed that 83% of the "non-play" group were white, versus 47% of the "play" group ($p<.005$). The rest of the boys in the "non-play" group were either black (11%), oriental (2%), or spanish (4%). The rest of the boys in the "play" group were either black (38%), oriental (11%), indian (2%), or spanish (2%).

Residential area of the families was also analyzed. The city of Berkeley was divided into two regions: east and west of the south-west tip of the University of California campus. The results of this analysis indicated that 67% of the boys in the "play" group lived in the western area in comparison to 44% of the "non-play" group ($p<.10$). The

western area is characterized by lower socioeconomic level than the eastern "Berkeley Hills" area. Analysis by schools indicated that 4 out of the 19 schools included 53% of all fire-plays and only 36% of the children studied.

Hence, the two fire groups differed in terms of parental educational level, father's occupational level, race, parental marital status and residential area. Other variables pertaining to family background such as the number of children , order of child in the family, standard of housing (evaluated by the interviewer on three levels) and annual income (annual income was $10,000 or less for 45% in the "play" group and 25% in the "non-play" group) did not show significant differences between children who did or did not engage in fire-play.

The parent questionnaire included an evaluation of family relationships. Results indicated that mothers of the boys in the "non-play" group reported better overall family relationships relative to mothers of the "play" group ($p<.05$). Hence, in addition to the finding that boys who played with matches came from more deprived background as presented by objective measures, they were also found to come from more deprived family settings according to the mother's perception of family relationships.

Child characteristics

1. Age

The mean age of the children who played with matches was slightly higher than the mean of those who did not (mean ages: 8.2 versus 7.7). Analysis of fire-play by age group revealed that while over 50% of the

children in the second and fourth grade were involved in fire-play, only 27% of the children in kindergarten were involved in such play. These findings suggest that most of the boys in the kindergarten group were too young to play with matches at the time of the interview. Therefore an effort is being made to follow the fire behavior of these young boys in an attempt to identify those who may play with matches in the future.

2. Cognitive and knowledge variables

Table 4 presents the mean values for the "play" and "non-play" groups for the cognitive and knowledge variables. The groups were compared via analyses of covariance with age as the covariate. All analyses (comprehension, picture arrangement, digit span and mazes) failed to show significant differences ($p<.05$) between the two groups. The only variable approaching this level of significance were the mazes ($p<.08$).

3. Personality characteristics

Health history failed to separate significantly between the "play" and "non-play" groups. The groups, however, did differ on history of accidents and behavioral problems. Of the boys in the "play" group, 71% had either cuts and bruises that required medical attention or broken limbs at least once relative to 39% of the "non-play" group ($p<.005$). Most of these medical problems resulted from falling during adventurous play. The two groups also differed on the number of children reported to have behavioral problems: 24% for the "play" group and 4% for the "non-play" group. Most of the behavioral problems in the "play" group

were related to hyperactivity and mischievousness.

In line with the above findings, it was also found that children who played with matches were reported by their mothers to be disobedient (13% versus 2%) and to have a feeling that everything is under their control (53% versus 22%) more often than children in the "non-play" group ($p<.05$). Boys in the "play" group were also perceived by their mothers to be more hyperactive ($p<.03$). Eighty-seven percent of all mothers also described their children spontaneously during the interview. A content analysis of these adjectives revealed that 43% of the mothers in the "play" group and 20% of the mothers in the "non-play" group described their sons mainly by using adjectives such as: "active", "hot tempered", "rebellious", "aggressive", "mischievous", the difference in frequency was significant ($p<.05$). On the other hand, mothers of the "play" group used adjectives such as: "cautious, "shy", "obedient", "considérate", "affectionate" less often relative to the mothers of the "non-play" group (35% versus 53%). The rest used a combination of the two categories of adjectives. The interviewer rated the children who played with matches as more careless, showing-off, impulsive, illogical, unreasonable, mischievous, and as less obedient, helpful, cautious, responsible, gentle, awkward, considerate and reliable relative to the children who did not engage in fire-play ($p<.05$ in analyses of covariance with age as the covariate). It is to be noted, however, that these differences in personality descriptions of boys in the "play" and "non-play" groups are not independent of the interviewer's knowledge about group memberships.

The difference in the behavioral problems between the "play" and the "non-play" groups was also reflected in the parental questionnaires. When asked about the frequency of engaging in mischievous behaviors, fathers of the "play" group indicated that their sons were more mischievous than fathers of the "non-play" group on 8 out of 20 behaviors measured. These behaviors included: stealing money from parents' purse, stealing objects from a store, breaking friends' objects, breaking household items, breaking toys, hurting pets, causing accidents for others, causing accidents for self, and setting fires ($p<.04$). Based on the mothers' reports three behaviors showed significant difference between the two groups: stealing from parents' purse, smoking cigarettes, and setting fires. The parents also evaluated the children on 16 activation measures, only "guilt" showed a significant difference between the two groups based on the mothers evaluations and "agitated" for fathers evaluations ($p<.05$). Mothers of the "play" group described their sons as more daring and jealous, while fathers reported them to be more unreasonable, anxious and less cheerful ($p<.05$). (The parents also evaluated themselves and their spouses on the same variables (40) used for evaluating their sons. Both mothers and fathers of the boys who played with matches perceived themselves as less competent than the parents of the boys who did not play with matches. Mothers of the first group also perceived themselves to be less sociable and their spouses as less knowledgeable, affectionate, responsible, curious and as more unreasonable. Fathers of the "play" group perceived themselves as more careless and their spouse as less intelligent ($p<.05$)).

The objective personality measures (Table 5) were the only personality indices failing to show significant differences between the two groups. (Note that there is a large number of missing data for the actometer due to errors in coding the data, this measure was also previously found to have low reliability. Hence, this variable will be omitted from future discussion.)

The different sources of the description of the boys: accident history and behavioral problems, mischievous behavior, perceptions of mothers, fathers, and interviewers, verbal and written responses of mothers as well as their spontaneous descriptions all show a common pattern, the matches-players were more active, mischievous,aggressive, lacking in impulse control, and having more disciplinary problems than those who did not play with fire.

4. Relationships with parents

The mothers of the boys who did not play with matches reported on the average better family relationships, better relationships between themselves and their sons, better relationships between their spouses and their sons, and better relationships between their sons and other children ($p<.05$). The two fire groups also differed on a number of punitive methods used by their parents. Fathers of the "play" group reported that they more often shook the boy, told him not to move and ignored his mischief ($p<.06$). Mothers reported more frequent use of telling him not to move, of taking away the special things the boy wanted, and making him do extra chores around the house ($p<.05$).

Mothers of the two groups were asked about their sons competence in

operating 30 household instruments. Though the two groups did not differ significantly on the number of instruments they could handle (20.5 for the "play" group and 18.7 for the "non-play" group), they did differ on the source of instruction in the use of these instruments; The "play" group learned how to operate 10.3 instruments from their mothers relative to 7.6 instruments for the "non-play" group ($p<.03$), while boys in the former group learned how to operate only 2.0 instruments from their fathers relative to 3.0 for the latter group ($p<.02$). These results suggest that boys in the "play" group had more training by their mothers and less by their fathers when compared to the "non-play" group.

5. Fire knowledge, behaviors and skills

The variables depicting fire knowledge did not separate the two groups (Table 6) when compared by analyses of covariance with age as the covariate.

The two groups did differ on the frequency of expression of different fire behaviors as reported by the mothers. The differences were significant for the attraction variables (attraction to fire, desire to play with fire, desire to light matches, $p<.02$). The "play" group was also reported to have higher mean values of competence ($p<.02$) but lower mean values of caution ($p<.05$) relative to the "non-play" group. The groups did not differ significantly on fear and avoidance (all were analyses of covariance, with age as covariates). (24% of the children in the "play" group still played with matches occasionally at the time of the interview).

Analysis of the fire experiment indicated that 80% of the boys in the

"play" group lit matches during the experiment, 69% of these boys showed acceptable competence level. (The respective percentages for the "non-play" group were 63% and 50%). As for the boys who did not light matches in the experiment, 33% in the "play" group and 65% of the "non-play" group refused to do it, the other cases involved mother's refusal to allow the boy to light matches. Analyses of covariance of the evaluations of the interviewers during the fire experiment showed that the "play" group was more competent in handling fire, but that mothers of the "non-play" group provided more support and gave clearer explanation when compared to the "play" group. ($p<.002$). A content analysis of the fire experiment transcripts showed that both mothers and children in the "play" group had a higher percentage of criticisms than the "non-play" group. Percentages of the other coded categories (praise, acknowledgement, directions, explanations, questions about activities and questions about explanations) did not show significant differences between the two groups.

Analysis of the exposure to fire hazard in the homes showed that the two groups did not differ significantly on the score for the home checklist or the overall number of the fires experienced by family members. The two groups did differ, however, on exposure to fire in the house: children in the "play" group more often came from houses in which the parents smoke relative to the "non-play" group (50% versus 33%, $p<.03$). On the average, mothers of the "play" group reported 13 cigarettes smoked daily in the home, versus 7 cigarettes for the "non-

play" group ($p<.05$). Interestingly enough, contradictory results were found for exposure to fireplace: children in the "play" group came more often from homes using the fireplace relative to the "non-play" group. These results could be explained by other variables (such as socio-economic status) which may be related to smoking and availability of a fireplace.

III. Who are the boys who set fires?

The play of 21 children led to fires, (fifteen set one fire, four set two fires, one set four fires and one set six fires), though most of them did not result in severe damage, it is of interest to compare this group to other groups of boys. It is believed that the most powerful comparison is between the boys who set fires ("fire" group) and the boys who played with matches without setting fires ("play only" group). The comparison was performed on family background variables as well as on the child characteristics.

Family background

Thirty-three percent of the boys who set fires lived with both their biological parents versus 54% in the "play only" group. Of the four adopted children in the sample, three were in the "fire" group. Two of these children had an extremely disadvantaged infancy: one was abused (broken limbs) and the other abandoned at a street corner, both were malnourished babies prior to their adoption. Both mothers ($p<.10$) and fathers ($p<.06$) of the "fire" group were less educated than parents in the "play only" group. Nineteen percent of the mothers and 54% of

the fathers of the "fire" group worked as professionals or semi-professionals, relative to 50% and 67% in the "play only" group. (33% of the boys in the "fire" group were white the others were either black (48%) or oriental (19%)) versus 58% of the children in the "play only" group. Examination of the residential area of the two groups showed that 76% of the "fire" group and 58% of the "play only" group lived in the lower socio-economic section of West Berkeley. Thirty-nine percent of the families of the "play" group had annual income of $10,000 or less versus 55% of the "fire" group. Though these differences did not reach the .05 level of significance, they are all in the same direction as the comparisons between the "play" and the "non-play" group, indicating that the "fire" group came from more disadvantaged backgrounds relative to the "play only" group.

Child characteristics

1. Age

The children who set fires were slightly younger than the children who played with matches without setting fires (mean ages: 7.8 and 8.6, $p<.08$).

2. Cognitive and knowledge variables

Analyses of covariance with age as the covariate were performed in order to compare the groups on the cognitive and knowledge variables. Results indicated that the "fire" and "play only" groups did not differ significantly on comprehension, picture-arrangement and digit span tests. The groups did differ, however, on the number of errors in the

mazes test ($p<.05$, Table 7).

3. Personality characteristics

The two play groups did not differ significantly in the number of health and behavioral problems. They did, however, differ on the severity of behavioral problems reported by their mothers. Six of the children reported to have severe behavioral problems were fire-setters as well as chronic matches players. The boy who set the largest number of fires (6) was reported to talk about suicide, he was the son of a single mother who was perceived by the interviewer to neglect him and to feel that he was a burden to her. The boy who set four fires was an adopted child, reported to be frequently involved in school fights. Two out of the four children setting two fires were also reported to have behavioral problems; One of them was highly mischievous, fighting constantly with friends and siblings and sometimes threatening them with a knife, the other was reported to be hyperactive especially after the recent divorce of his parents, both boys were seeing a child psychologist. Two of the boys who set one fire were reported to have problems with their mothers; One of them told lies, and the other was described as being "stubborn" and "rock headed" by his mother. In comparison, the mothers of the "play only" group reported minor problems (e.g., shyness, asking reasons for things, problems in new social situations and occasional battles of will).

The fire-setters were perceived by their mothers to rush into things without thinking ($p<.004$), to hurt themselves when they play ($p<.03$) and to be inconsiderate of other people ($p<.06$) more often than

the boys in the "play only" group (analyses of covariance with age as the covariate). The mothers of the "fire" group spontaneously described their children as "active" more often than mothers of the "play only" group (52% versus 24%). The mothers' written evaluations showed that the "fire" group was perceived as more careless, hot-tempered, and less skillful, competent and mature than the "play only" group ($p<.06$). Comparisons of the two groups on frequency of mischievous behaviors as rated by mothers showed that the "fire" group was perceived to be involved more often in: breaking friends'objects, telling lies, tearing clothes, breaking toys, causing accidents for self, smoking cigarettes and setting fires ($p<.05$). Analyses of covariance with age as the covariate for the evaluations of the interviewers did not show any significant differences between the "fire" and the "play only" groups at the .05 level of significance.

The objective personality measures (Table 7) indicated significant differences between the groups on the draw-a-line and the block tower tests at the .10 level with fire-setters having lower mean values on the former and higher score on the latter than the boys who played with matches without setting fires.

Overall, the analyses of personality characteristics did not show significant differences between the "fire" and the "play only" groups, suggesting that the two groups were very similar on most measures. Some of the verbal parental reports, however, suggest that a number of the repeater fire-setters had more acute behavioral problems and were more mischievous in comparison to the other boys who played with matches.

Further individual analysis, based on the interviewers' reports was performed for the children who set fires, the following information emerged from this analysis: Six boys who played with matches repeatedly were highly mischievous and had problems in other areas: they were described as aggressive, hyperactive, and mischievous as well as having a low attention span and a low level of impulse control. Five children showed specific problems which may have been influencing their fire behavior; Two were sons of recently divorced parents, one had repeated problems (setting fires and being lost) when left unattended while visiting with his divorced father. Two boys set fires when left unattended, one of them during the hospitalization of his mother. Four boys set fires, apparently under the influence of older children, mostly siblings. The other children set fires either as experiments or out of boredom. These data show a variety of situations in which fire-setting occurred, some directly related to adventurous plays while others related to stressful family conditions.

4. Relationships with parents

No significant differences in mothers' perceptions of family relationships were found between the two groups. Analyses of covariance with age as the covariate revealed that mothers of the "fire" group used more often making the boys do extra chores around the house and telling him not to move as punitive methods ($p<.05$).

5. Fire knowledge, behaviors and skills

The fire knowledge indices did not show any significant difference at the .05 level between the "fire" and the "play only" groups. The

only variable showing some difference (in analyses of covariance with age as covariate) was the function understanding of fire items ($p<.10$) indicating that the "play only" group had better knowledge in this test. The two groups did not differ on the frequency of any of the fire behavior variables reported by the mother (Table 8).

The mothers also reported that 33% of the boys in the "fire" group versus 79% of the boys in the "play only" group were allowed to light matches under parental supervision ($p<.05$). Of the boys in the "fire" group 33%, and 17% of the boys in the "play only" group were reported by their parents to play with matches occasionally at the time of the interview.

During the fire experiment 76% of the boys in the "fire" group and 83% of the boys in the "play only" group lit matches. Acceptable competence in lighting matches was shown by 43% of those who lit matches in the former group and 62% in the latter. All (N = 5) the boys in the "fire" group who did not light matches wanted to do it but were not allowed to do so by their mothers. Only one mother of the "play only" group did not allow her son to light matches during the fire experiment. The interviewers' evaluations of the fire experiment did not show any significant differences between the two groups (Table 8).

IV. Who are the boys who did not play with matches?

The boys who did not play with matches were separated into two groups: boys who never lit matches prior to the interview ("never" group, N = 25) and boys who were allowed to light matches under supervi-

sion ("supervision" group, N = 29). The boys in these two groups were compared on family background variables and child characteristics.

Family background

Most of the boys who did not play with matches lived with both their biological parents (76% in the "supervision" group and 64% in the "never" group), and most of them were white (86% in the "supervision" group and 80% in the "never" group). The groups did not differ on standard of housing, or on income (31% of the families of the of the "supervision" group had an annual income of $10,000 or less versus 20% of the "never" group). The children who were allowed to use matches under supervision had more educated fathers ($p<.003$) and mothers ($p<.063$) relative to the "never" group. Though a large number of fathers in the two groups were professionals, more fathers in the "supervision" group (48%) were professors, attorneys, physicians and engineers than in the "never" group (21%). A larger percentage of mothers were professionals for the "supervision" group (38%) than the "never" group (16%).

The comparisons between the two groups of boys who did not play with matches indicated that though most differences did not reach the .05 significance level, the children from the "supervision" group tended to come from more "enriched" backgrounds in terms of parental education and occupation though not in terms of income or standard of housing.

Child characteristics

1. Age

The boys who were allowed to light matches under supervision were

older than the boys who did not light matches at all (mean age: 8.2 and 7.0, $p<.02$). Interestingly enough, four 10-year old boys never lit a match prior to the fire experiment.

2. Cognitive and knowledge variables

Analyses of covariance with age as the covariate did not show any significant differences between the "supervision" group and the "never" group on any of the cognitive variables (Table 9).

3. Personality characteristics

The two groups of boys who did not play with matches did not differ in the number of health and behavioral problems, nor did they differ on the different parents' evaluations during the interview or on the objective personality measures (Table 9). The mothers of the "supervision" group spontaneously described their children as active in 8% of the cases versus 35% in the "never" group. Analyses of the mothers descriptions of their children on the 40 adjectives showed that the boys in the "supervision" group were perceived as more competent, skillful and mature, and less careless and hot-tempered relative to the "never" group ($p<.05$). The two groups also differed on their personality characteristics based on the perceptions of the interviewers. Out of the 40 adjectives evaluated by the interviewers 14 reached the .05 significant level and additional 10 reached the .10 significant level on analyses of covariance with age as the covariate. The adjectives which reached the .05 level of significance were: helpful, competent, friendly and considerate (with "supervision" group having higher mean values), and shows-off, hot-tempered, illogical, hostile, stubborn, aggressive, un-

reasonable, awkward, jealous (with "never" group having higher mean values). These surprising results suggest that the boys who were allowed to light matches were also perceived as more positive in terms of their personality characteristics than the boys who never lit matches. Together with the previous findings it seems that the "supervision" group came from more enriched background and was more adaptable to the demands of the environment, while the "never" group was somewhat similar to the "play" group in that it may include several potential problem children who unfortunately may have a higher likelihood of being involved in future fire-play.

4. Relationships with parents

The two groups did not differ on mothes' perceptions of family relationships. Mothers of the "never" group reported that they used more often yelling at the boy and shaking him as a punitive method ($p<.05$).

5. Fire knowledge, behaviors and skills

The only fire knowledge variable on which the two groups who did not play with matches differed significantly ($p<.05$) was the knowledge about fire situations (Table 10). Children in the "never" group who did not have any exposure to fire, knew less about reactions to hazard situations than children in the "supervision" group. Children in the first group were less involved in handling fire and electrical equipment in the home ($p<.05$). The two groups also differed on the fire behavior variables reported by the mothers. The children in the "supervision" group were described as showing competence, caution and desire to light

matches more frequently than the "never" group ($p<.05$). The two groups, however, did not differ significantly on attraction, avoidance, fear of fire and desire to play with fire.

During the fire experiment 83% of the boys in the "supervision" group, versus only 31% in the "never" group, actually lit matches ($p<.05$). The children who did not light matches in the "never" group either refused to do it or were forbidden to do so by their mothers. The evaluations of the interviewers (Table 10) during the fire experiment showed that the mothers of the "supervision" group provided more support ($p<.001$) and allowed more responsibility ($p<.002$) than the mothers of the "never" group, and that the children in the first group were more competent and less uncomfortable in performing the task ($p<.06$).

The above information indicated that the "supervision" group had more involvement in fire situations and a higher level of competence in dealing with fire relative to the "never" group.

DISCUSSION

Fire, a term beautifully describing passionate human emotions, a term often appearing in poetry and mythology is basically a chemical reaction which is a source of delight as well as horror, warmth as well as disaster, fascination as well as fear. This ambivalence attached to fire develops through the process of socialization, but for many children is preceded by a strong fascination and interest. The initial interest in fire is often expressed by watching jumping flames of candles, fireplaces and campfires and the initial attempts to control it are expressed by a desire to light candles, fireplaces and cigarettes. Some

parents when detecting this interest encourage controlled acquisition of fire skills by setting explicit constraints for fire use and by providing support and supervision for its expression. Unfortunately, they are a minority, most parents react with authoritative anxiety by denying any fire experience and by prohibiting any kind of fire use. This denial is not always accepted by young children, especially boys, who occasionally engage in prohibited and sometimes hazardous fire-play.

I. Fire behaviors, skills and knowledge

In the present study the prevalence of fire interest and fire-play of normal young boys sampled randomly was systematically studied. The results showed that fire interest is almost universal and that fire-play is performed by almost half of the boys studied. The high prevalence of fire-play is alarming, it supports Lewis and Yarnell's (1951) observation that "undoubtedly the incidence of children who play with fire is far greater than any statistics show" (p. 285), and indicates a severe problem with fire prevention efforts of parents and social institutions. The existence of the problem is further exemplified by the direct connection between the number of incidents of fire-plays and the probability that they will result in actual fires. In the present study it was found that single instances of fire-play resulted in fires for 33% of the cases while 81% of the repeater fire-players caused fires. The fires, set by 21% of the boys studied, were mostly small fires which were easily extinguished. However, the severity of the fire is affected not only by the child's behavior but by chance factors such as availa-

bility of combustible materials and weather conditions. (For instance, the one fire in the study which resulted in severe damage to a house was caused by the first fire-play of a child.) Hence, educational efforts should be addressed not only toward the prevention of repeated incidents of fire-setting but toward the prevention of fire-play in general. The prevention efforts should be directed toward the satiation of the interest in fire combined with elimination of hazardous fire-play.

Gross underestimation of our statistical information about children's fire-setting is reflected by the percentage of fires reported to the fire department. Only 9% of the fires set by the boys were reported, and 33% of the fires set by other members of the family, so that on average 24% of the total fires were reported. The latter percentage is closely similar to the one found by Globerson and Grossman (1971), in their survey of 500 staff members of the University of California at Berkeley sampled randomly, 21% of the total number of fire incidents were reported to the fire department. Globerson and Grossman also reported that the frequency of fires was 0.07 incidents per person per annum. The present sample reported the occurrence of fire incidents for 9 out of 10 households, though most of the fire incidents were minor several resulted in severe damage and grief. Human hazardous behavior accounted for all fires set by the children who played with matches, and was the direct cause of 31% of the other fires.

Children's interest in fire was found to start at an early age, 18% of the fires set by them were set before the age of 3. This result supports Nurcombe's (1964) finding that interest in fire starts between age

2 and 3, and Block, Block and Folkman's (1976) generalization that fire assumes increasing salience between the ages of 3 and 6. The present study showed a decreasing tendency in the number of fires beyond age 7. Very few fires were set after this age (none after age 8) even when the number of children who were older than 7 at the time of the interview is considered. These results indicate that although a relatively small percentage of children play with matches at a very early age, fire-play is essentially dangerous and often results in actual fires due to the children's lack of competence in handling fire materials. However, the decrease in the number of fires by no means indicates a decrease in fire interest. Comparisons of fire interest among the three age groups as reflected by parental reports showed the same percentage of boys expressing interest in these groups (Figure 1). The same results are reflected by the reported frequencies of fire behaviors (Figure 2) which showed that only fire competence increased with age while other attraction and avoidance behaviors were relatively stable within the studied age groups, with the peak of the attraction in the second grade. Furthermore, attraction, avoidance and competence were found to be three independent components of fire behavior: to fire in positive and constructive ways which encourage competence rather than attempt to eliminate fire attraction.

Analysis of the fires set by the children revealed that the boys had, in most cases, a high level of understanding about the possible consequences of their play and about the violation of behavioral codes involved in it. This seems evident from the fact that they set the fires

in places which could not be easily detected by adults. These places were either outside the home e.g. yards, fields or forests; or inside the home, e.g. bedrooms, bathrooms or basement, places where fire is not normally used. The same trend was found for boys who played with matches without setting fires, in several cases, the play was never detected by the parents and the child reported it while confiding in the interviewer. Over half of the fires were set in groups as part of their adventurous play, and some reported reactions of excitement to the fire. Most of the boys admitted their participation in fire-play and were aware of the risk involved in it. Some of them made interesting comments such as "I am through with matches", "I don't play with matches any more, I learned my lesson", "I played with matches only when I didn't realize they could start fires", or "most of the boys I hang around with play with matches", "my friend tried to light a pack of matches. I tried to stop him but he wanted to know how matches work", "I don't get in trouble if they (parents) never find out (about it)". These comments indicate both the awareness of danger and the fascination with fire and reflect the development of ambivalence toward fire. Other comments made by the children reflected the punishment attached to playing with matches. Examples of such comments were: "Grandmother found me and beat me", "I got a lot of spankings and I just can't do it anymore", "Mom made us stay in for a few weeks". In fact, 65% of the boys interviewed had some comments when asked "have you ever played with matches?". These comments reflect their own involvement or the involvement of other children in playing with matches. Only 35% of the boys

said a blunt "no" when asked this question. Furthermore, fire play was not at all related to fire knowledge. There were no significant differences between the children who played with matches and those who did not on any of the indices measuring knowledge about fire situations. These findings indicate lack of correspondence between the cognitive and behavioral aspects of fire and they suggest that an increase in cognitive knowledge and understanding about fire is not a sure route to decrease the prevalence of fire-play and fire-setting. Most educational programs cope mainly with the cognitive knowledge component, they are very important in creating fire awareness and teaching people correct coping mechanisms in case of hazard. However, fire prevention programs should also "recognize that fire is fascinating to children and must satisfy their curiosity in acceptable ways...An opportunity seems necessary for each child to experiment directly with fire safety and under supervision" (Folkman & Taylor, 1972, p.4). Such fire programs may be a further step toward a decrease of fire-play and fire-setting. Hence, there is an urgent need to attack the problem by new and constructive ways which should be tested rigorously; This undertaking is the focus of the next research effort.

In addition to the investigation of fire interest, hazardous play and fire-setting, the other side of the coin, namely fire knowledge and skills of parents and children, were also investigated. Parents showed an acceptable level of fire knowledge and information, though many individual items indicated deficiencies , especially in the area of prevention, preparation and skills (e.g. conducting home fire escape drills,

instructing babysitters about fire, leaving small children alone, knowledge of fire department telephone number, owning fire extinguisher and smoke detectors). Only 43% of the mothers reported that they had some form of fire education, usually in primary school. Parents' reports also showed a high level of awareness to fire hazards coupled with problems in handling them. Sixty-eight percent of the mothers indicated that the danger of fire is the main thing they want to teach their children about, and 44% expressed that fire is their major worry when they leave children unattended. When asked, however, about the way they handled the fire interest of their children, 38% of the mothers of boys who expressed some interest in fire dealt with it by either ignoring or by warning or forbidding the child to use any kind of fire. The existence of parents' problems in dealing with the fire behaviors of their children is also indicated by some of their reactions to the fires set by their children. Many mothers reacted either by expressing fear and anxiety ("I was horrified", "I was paralyzed and freaked out", "I was very upset and called "Parental Stress" unit) or by rage and severe punishment ("I gave the child a whipping", "I was very angry and apprehensive", "I was more concerned about the child than putting out the fire"). The above data indicate that though there is a high level of awareness about the risks of fires, a large percentage of parents do not deal with it directly by giving constructive instructions and providing their children with fire skills and knowledge, a result which replicates previous findings (Block, Block & Folkman, 1976).

Lack of appropriate instructions is obviously reflected in the

children's knowledge and indeed many gaps were found in this area: about half of the boys could not assign plastic, rubber, chalk and aluminum items correctly to burnables or non-burnables. In addition, many children did not know the correct responses to various fire situations (e.g. clothes catching fire, smoke in the room). As for the actual fire skills observed during the experiment, the results showed that only 42% of the children were reasonably competent in dealing with matches (competence was defined using a lenient criterion as the ability to strike matches under supervision and extinguish them immediately), though only a few were competent in conducting the experiment as a whole (including a safe use of the camping stove). Competence, increased with age and was found to be high mainly for two groups of children: those who were allowed to light matches under supervision and those who had experience in fire-play without fire-setting. Most boys in these two groups were allowed to light matches under supervision at the time of the study. Most of the mothers who forbade their children to use matches were mothers either of children who had never used matches previously or children who set fires. All the fire-setters who did not light matches during the fire experiment were forbidden to do so by their mothers. The latter finding supports the results of Siegelman and Folkman (1971) which indicated that mothers of repeater fire-setters tried to prohibit the use of fire materials under any conditions. These findings indicate that the over-protective mothers who would not allow their sons to light matches were either mothers of children who did not have any fire experience or who had fire-setting experience. Most boys in these two

groups were not normally allowed to light matches at all. It should also be noted that several boys had exceptionally high awareness of fire safety; Two boys who were allowed to light matches under supervision actually asked their parents to purchase a smoke detector and a fire extinguisher.

These results point to the need to develop and implement fire skills and prevention programs which are readily available to both teachers and parents. Educators who are involved in parent counseling and who write child rearing guides should also be encouraged to include fire information as an integral part of their work. An indication that parents will be receptive to such guidance is provided by the responses of parents during the interview. Many parents expressed fear of fire as a major concern when leaving children alone, several parents asked the interviewers for advice in this area, one parent called the "Parental Stress" unit and one the fire department for help after their children set fires. Ray Walters (Personal Communications) reported that most of the children who participated in the Hayward fire-players program did so because their parents called the fire department and asked for advice on handling their children's fire-play. A more rigorous research support for parents awareness to the fire hazard was provided by Winget and Whitman (1973) who asked 300 adults sampled randomly: "If you had a child who repeatedly set fires, what would you do about it?" Their results showed that 54.3% of the responses indicated some kind of professional referral and 13.7% indicated reference to police, fire department or control at home. These findings indicate that there is high

recognition of the seriousness of the problem of fire-setting.

The seriousness of the fire-setting problem has been recognized by social institutions and many fire prevention programs have been developed and tested all over the country. For the purpose of illustration three such programs will be presented briefly. They represent fire prevention programs designed for different educational agencies: parents, teachers and fire specialists. The programs were financed by the California Department of Forestry, and by the USDA Forest Service. Thousands of children were exposed to the Team Teaching Program in California since 1967 and 2,451 children were involved in an evaluation project designed to assess the effectiveness of the program. The evaluation reported by Ryan (1976) and by Ryan, Gladen and Folkman (1978) showed significant differences between the experimental and control groups on achievement tests but not on attitude measures. Folkman and Taylor (1972) reported the results of the evaluation of a fire prevention program taught by teachers in the Headstart Project in Riverside County during the 1968-1969 school year. The project which involved 942 children showed no significant differences between experimental and control groups of the affective measures used, and only a few significant differences in achievement scores. In addition, both studies found high teacher satisfaction from the programs. The third study, reported by Vance, Rogers and Folkman (1977) involved fire prevention program designed for parents. It included three experimental groups varying on the presentation techniques (book/cassette, book/cassette / practice, slides/cassette) and one control group. Results showed that all experi-

mental groups were better than the control group on objective mastery tests used in the study. No consistent significant differences were found among the experimental groups. All three studies found effect of age on the cognitive measures.

The above three evaluation studies showed reasonable success in enhancing cognitive knowledge about fire, knowledge which is highly important for coping with hazardous situations once they occur. The studies, however, showed no effect of the prevention programs on affect variables and did not test "the effectiveness of the program on the child's behavior in real situations where matches and other flammable items are available but an adult is not around to supervise the child's activity" (Vance, Rogers & Folkman, 1977,p.44). The inclusion of behavioral measures of fire-play in future evaluation studies is highly encouraged. The inclusion of such measures seems vital for further contribution to the solution of the serious problem of child-caused fires. It is hard to predict the magnitude of the effect of existing programs on actual fire behaviors in natural setting. The lack of relationships between fire knowledge indices and fire behaviors found in the present study may suggest that cognitive training does not suffice for enhancing fire skills and preventing fire-play. The present study, however, did not explore the effects of prevention programs or fire behaviors, and by no means provides an answer to this question. There is a need for promoting research directed toward assessing the effects of cognitive training on fire behaviors, and for assigning equal importance to the cognitive and the behavioral components of reactions to fire in future

fire prevention programs. This could be done by increasing the importance of the practice component which is already included in several prevention programs.

So far, the discussion of fire skills, knowledge and behaviors points mainly to the complexity involved in the topic. Traditionally the literature has concentrated on two components of fire study: The study of fire-setters which has been embedded in clinical research of what was termed "pyromania" or "incendiarism", and the study of effectiveness of fire prevention programs usually done by educators and fire prevention specialists. In the present study an attempt was made to investigate the prevalence of cognitive and behavioral aspects of fire in a random sample of boys. Briefly summarized, the findings showed that fire skills and knowledge of children are largely independent from fire attraction and fire-play, and suggested that future prevention programs should evaluate the behavioral as well as the cognitive components of fire reactions of young children.

II. Who does or does not play with matches?

The comparison between children who played with matches and those who were never involved in fire-play showed several interesting and consistent results in terms of the characteristics of the children and their family background. The analysis of the child's characteristics revealed that playing with matches is not just one stage in the development of normal children, but rather a symptom which is highly related to other problem areas in the children's life. The personalities of the

children who played with matches showed a surprisingly consistent picture. This picture can be reduced to one "non scientific" term by describing a child who plays with matches as a "rascal". This child is mischievous, energetic, active, adventurous, showing-off, aggressive and impulsive more than his peers. He is more often involved in adventurous plays leading to accidents and has more conduct problems reflected by his interpersonal relationships with parents and friends. This picture of the child fire-player was drawn from all evaluations collected during the interview, evaluations performed by parents and interviewers, evaluations reported orally or in writing, evaluations which were responses to structured questionnaires and which were spontaneous descriptions of the child, showing the same pattern. Hence, playing with matches was not found to be an isolated problem but rather a part of the child's mischievous behavior.

The above picture of the fire-players is similar to the picture of fire-setters which emerged from the literature survey reported in the introduction. This similarity is surprising especially in light of the fact that the present study surveyed the behavior of a random sample of normal children, whereas the studies of fire-setting investigated children who had a variety of other problems. The similarity suggests a behavioral continuum, which has on one extreme the repeater fire-setters, close to it are the non-repeaters, then matches players and then, on the other extreme children who are devoid of behavioral problems and risk-taking behaviors.

This pattern of personality of the matches-players and fire-setters

was also found to be very similar to the personality of the accident-repeater children. As indicated in the introduction this picture was presented by Manheimer and Mellinger (1967) and supported by Block and Block (1975), children who are frequently involved in accidents are mischievous, aggressive and impulsive, traits which lead them to high accident exposure.

The "rascal" is not only prone to hazardous fire behaviors and accidents but has also similar personality characteristics to those of the hyperactive child as well as the delinquent child. Research pertaining to the two areas will be reviewed briefly in order to show the similarity of their findings to those of the present study.

The hyperactive child has recently attracted the attention of educators and child psychologists. Hyperactivity which is synonymous to hyperkinetic behavioral pattern was defined as a long term childhood pattern characterized by excessive restlessness and inattentiveness (Safer & Allen, 1976). Hyperactivity has been described as a developmental disorder which begins in early childhood and fades during adolescence, it is sometimes also described as predelinquent pattern. The major features of hyperactivity are inattentiveness, learning impediment and behavioral problems, the minor features are impulsivity, peer difficulties and low self-esteem. (Rapaport and Benoit (1975) found high correlations between home observations, psychological reports and teachers ratings, indicating the stability of hyperactivity across situations). Most of these features were also found in the personality of matches-players.

Coleman (1972) provided clinical descriptions of anti-social personality. One of these descriptions stressed irresponsible and impulsive behavior with low frustration tolerance, proneness to thrill seeking, deviant and unconventional behavior and seeking immediate pleasure and gratification. This clinical picture also describes what he called psychopathic delinquents who are again: defiant, resentful, devoid of guilt or remorse, unable to profit from experience, lack conscience and reality control, are at the mercy of inner impulses, seek stimulation and excitement, live in the present and are incapable of establishing and maintaining interpersonal ties. This picture of boys was presented in a number of classical studies in the area of child delinquency. Glueck and Glueck (1952) compared 500 delinquents to a matched group of nondelinquents. Among their findings they reported that delinquents are extremely restless, energetic, aggressive, stubborn and adventurous, they express uninhibited, untamed and unreflective characteristics and inability to cope with the general process of socialization and adjustment and with the realistic demands of life. They also have inter- personal problems with peers, teachers and parents. Bandura and Walters (1959) compared 26 delinquents to 26 nondelinquents. The delinquent-aggressive boys were openly antagonistic to authority and less positive in their feelings toward their peers. Conger and Miller (1966) compared 271 delinquents in Denver Public Schools to nondelinquents. They found that delinquents were overly aggressive, less well adapted, resented authority and manifested problems in social, academic and emotional areas. All studies found that delinquents came from more deprived backgrounds

relative to nondelinquents, especially in terms of relationships with their fathers.

The discussion of fire-setters, accident prone children, hyperactive children and delinquent children showed that they are characterized by similar behavioral and personality patterns, the "rascality" pattern (or what Siegelman called the "impulsive" syndrome). It is customary to view this pattern as a highly negative one since it is related to so many negative consequences. However, embedded in some of the above studies is also a list of positive characteristics expressed by the "rascals". The first general positive trait is their level of energy, high level of activity should not be viewed exclusively as negative, is the opposite trait: dullness, exclusively positive? In studies of delinquency, some delinquents were described as more mature, independent, assertive, vivacious, curious and adventurous, and less neurotic, submissive, insecure and conformists relative to their non-delinquent peers. Undoubtedly, these characteristics, expressed by problem children are highly desirable in our society. However, they are sometimes "hidden" in research reports and receive no explicit discussion. Exceptions to this rule do exist, many psychologists pointed to the differences between assertiveness and aggression and discussed the philosophical issues involved in overcontrol and risk avoidance at the price of spontaneity and creativity in our value system (Manheimer & Mellinger, 1967). Others claimed that intervention efforts can be directed to reduce exposure to hazard while retaining "the positive personality characteristics that are correlates of risk taking, curiosity, openness

to experience, vitality" (Block & Block, 1975, p.116). Hence, it is suggested that the "rascals" are not exclusively negative in their behavioral pattern but also possess several personality assets. The "rascality" pattern can be defined on several planes each including several features. The physical plane including high arousal level (vivacity, alertness, energy), adventurous behaviors (physical risk taking) and physical sensation seeking. The cognitive plane may involve alacrity (psychological zest and need to exert mental effort), knowledge or information seeking, and the more negative feature of distractability and short attention span. The motivational plane may include such features as curiosity or exploration, non-physical risk taking and mischief or destruction (defying of social norms). The personality - social plane includes features such as impulsivity, social aggression and feelings of omnipotence or overcontrol over the environment. These four planes may serve as a rudimentary framework for the definition and study of "rascality", its validity is obviously unknown, and the relations among the features are still unclear. The focal point of this argument is the need to consider the positive components of what is customarily viewed as "mischievous" behavior.

The "rascality" syndrome may help in understanding the apparent contradiction in the personality descriptions of repeated fire-setters (Siegelman, 1969). While they are perceived as more mischievous, boisterous and tempermental relative to the non-repeaters, they are also perceived as more curious, enthusiastic, imaginative, masculine and original. These latter traits reflect the positive aspects of "rascals",

the traits which make them likeable and attractive as much as their other traits make them a nuisance to their parents. The combination of the negative and positive components of "rascality" may explain the emotionally ambivalent reactions of the mothers to the repeated fire-setters in Siegelman's study.

The present study did not find any difference on "pure" activity level for children who play with matches and those who do not (as indicated by the activation items evaluated by parents). The other two variables presently studied, ego-control and ego-resiliency are highly related to the argument made above. Though most of the objective personality measures depicting these variables did not show consistent significant differences, they were the only ones which sometimes separated the different fire groups (especially the block tower test). These partial findings are strongly supported by the evaluative measures and the child's accident history. When combined they suggest that lack of impulse control is the major problem of fire-players, a suggestion obviously needing more research support. Acceptance of this suggestion implies the need for the development of constructive ways for impulse expression, ways that may replace fire-plays and other hazardous behaviors of "rascals". It may be speculated that the conduct problems shown by "rascals" do not stem exclusively from their personality make-up as suggested by psychoanalytic theories but from their personality as interacting with their environment. The high energy children are difficult to cope with and pose problems to their environment, including parents and teachers. Hence, their background should be considered as

interacting with their personality traits, if a psychological rather than a sociological explanation is sought. Traditionally, conduct problems were viewed as dependent variables with family background as an independent variable. The point made here, is that as much as parents affect the behaviors of their children, children affect the behaviors of their parents. The high energy children pose problems as much as challenge to parents and other educational agents, in the fact that they require more channeling of energy, more direction and guidance for impulse expression in a productive manner. The problem is not in their high activity level per se but in the mechanisms for channeling it to positive directions and in the mechanisms for impulse control and adjustment to the demands of the situation.

Several studies dealt with the familial conditions necessary for the development of impulse control. Though it is not attempted to cover this literature completely, part of it will be used as the basis for explaining the interaction between the characteristics of the child and the features of his family background as affecting "rascality". Block (1976) presented a comprehensive review of the literature in the area of familial factors associated with affective disorders. In discussing undercontrolled, impulsive and aggressive children, she concluded that they "appear to have grown up in homes where the parents are hostile and rejecting and set few limits" (p.28). This conclusion has two very important implications for the present study, it presents the importance of warmth and support on the one hand and firm and structured constraints on impulse expression on the other. Though the present study

was not systematically designed to test these conjectures it includes several indirectly relevant findings. Mothers of children who did not play with matches reported better family relationships, better relationships between themselves and their sons, better relationships between their spouses and their sons and better relationships between their sons and other children when compared to mothers of matches-players. Parents of the "play" group also reported more frequent use of harsh punitive methods such as shaking the boy and taking away many privileges, than parents of the "non-play" group and some also reported severe physical punishment for matches-play. (Punitive methods are also relevant to the topic of setting limits). Good family relationships and appropriate disciplinary procedures are imperative for feelings of warmth, acceptance and support. In addition to the reports of the parents, the interviewers also observed the parents' behaviors during the experimental tasks. The results showed the mothers of the "non-play" group provided more support to their children during the experimental interaction. Content analyses of the experiment's transcripts also showed that mothers of the "non-play" group provided their children with less criticism relative to the "play" group. Several matches-players were also under situational stress which may have interferred with the feeling of warmth and support in the home, examples were recently divorced parents and hospitalization of the mother. A focal point in the family interaction is the son-father relationship. This relationship was perceived as of crucial importance in fire-setting and delinquency studies (see Introduction). Other studies also suggested that the availability of the fa-

ther enhances problem solving ability of children (Blanchard & Biller, 1971; Reis & Gold, 1977) and that father's nurturance and dominance in the family are positively associated with learning male-sex role (Lynn, 1974). A partial indication for the importance of this variable in the present study is the finding that children who did not play with matches were taught the use of more household instruments by their fathers than the matches-players. In addition, fathers of the "play" group perceived their sons to be more mischievous and negative on many more behaviors than the mothers did, and mothers perceived them to have worse relationships with their sons relative to the "non-play" group. These findings, though incomplete, indicate the existence of problem relationships between sons and fathers for the children who play with matches.

The above combination of findings indicate that children who had conduct problems as expressed in fire-play suffered from more rejection and less support and warmth relative to their non problematic peers, supporting the first part of Block's statement. This part dealt with the quality of interpersonal relationships in the family, while the second part dealt with "setting limits". "Setting limits" is understood as the provision of constraints in terms of the conditions under which certain behaviors should not occur. This conjecture has also been promoted by other researchers and has been summarized by Block and Block (1975) by stating that "children develop self confidence and impulse control in a family setting in which the parents feel themselves neither helpless nor intimidated and are able to manage their own lives and to deal with the child authoritatively" (p.109; see also Baumrind,

1973). Though the present study was not designed to test this conjecture there is some indirect evidence to support it. Fathers of the "play" group indicated the more frequent use of ignoring the problem as a punitive method. Ignoring mischievous behavior is not always a constructive way to cope with the child's problems. Fathers of the "play" group also reported more often shaking the boy and telling him not to move than fathers of the "non-play" group. The latter punitive method was also used more often by mothers of the "play" group, together with making the boy do extra chores and taking away several things he wanted. These methods are not necessarily effective in setting constraints to the child's mischievous behavior. In addition, during the fire experiment, the mothers of the non-play group provided clearer explanation for the task, explanations that better presented the appropriate uses and misuses of fires. Several parents in the "supervision" group indicated that they spent time in training their children about fire skills and also allowed their children to participate in the use of fire in the house. These parents took the time to clarify to their children what is an appropriate or inappropriate behavior. These findings support Block's (1971) conclusion that "in order for the child to become appropriately controlled someone has to invest time and trouble" (p.263). In analyzing data from the Berkeley longitudinal studies Block (1971) surveyed the development of ego control through life and concluded that the adult undercontrolling male was neglected by both parents as a child. His parents "did not invest the time, exhibit the constraints needed to deliver the percepts of self-regulation to their child"

(p.264). His mother was found to be neurotic (note that mothers of the "play" group defined themselves as more depressed relative to the "non-play" group in an incidental questionnaire not reported previously) and self-indulging rather than selflessly maternal, and his father was a detracted, indifferent, self-absorbing man. Block (1971) also noted that "because of the essential selfishness of the parents in pursuing their own lives, little effort was expended on socializing the boy via verbal, rational means, or on showing him skills or on encouraging his interest, or on simply being present" (p.262). Though all the above components were not studied here, the present findings are in the same spirit as Block's conclusions and suggest future research questions concerning parent - child interaction of children who are and those who are not involved in fire-play.

Parental warmth and their quality of intervention efforts in "setting limits" seem to be highly crucial for "rascal" boys. These boys who express a high level of vigor, physical activity and risk taking behaviors often exceed the parents' tolerance threshold for impulse expression. Hence, the parents of "rascals" need to exert more effort in their interpersonal relationships with their sons, and attempt to channel the energy of their children into constructive impulse expression. This is not an easy task, and many parents fail to perform it due to the high level of demand played on the parents. The parents have to accept the task on a moment-to-moment basis, to provide their children with skill training and development of their ability through a supportive and structured environment both inside and outside the home so that their

energy will be directed toward constructive channels. These channels should provide satiation for the children's activity and exploratory behavior in a socially functional way without overinhibition of creativity and alertness.

The preceding discussion as scanty and incomplete as it is provides several suggestions concerning the effects of parent- child interaction on the child's behavior and mainly on his ego-control which affects his exposure to hazard situations. The features of the child environment and especially his family background should be considered in light of the above. It was found that matches-players came from more deprived families relative to their non-playing peers. This relative deprivation was reflected by parents' marital status, education, occupation and residential area as well as in terms of family interpersonal relationships. Though it is impossible to relate all these sociological variables to the psychological mechanisms presented above, several general speculations may be offered. The unavailability of the two biological parents (especially fathers) for the "play" group may account for some of the problems in interpersonal relations and lack of stability in the house and absence of tolerance for the child's impulse expression. Several mothers of the "play" group were young single women who struggled for financial survival and for the enhancement of their own lives. They may lack child-rearing skills and are often helpless when they attempt to cope with the burdens of parenthood. As to the level of education of the parents, there are some indications in the data that suggest that the more educated mothers perceive their sons as more competent,

responsible, and intelligent indicating that they may have a more rational and problem-solving approach to child-rearing. Family stability and high level of parental occupation and education may also provide the child with positive identification figures who provide him support and reinforcement. It is obvious that highly educated, professionally successful and intact family parents are not necessarily better performing their parental roles but the data indicate that their children have a higher chance of getting support and direction. A note of caution is repeated here, these conclusions are speculative in nature and need further research before they are clarified and fully accepted. Future research effort should deal with the relations between sociological variables and actual socialization procedure adopted by parents, should clarify such general concepts as "setting limits", "restrictiveness", "warmth", and tie them to actual parent-child interaction (for systematic implications for research in this area see Block, 1976).

III. Implications for fire prevention

For many children fire is an object of fascination and attraction at a very early age, the interest in it increases sometimes prior to the development of caution and competence. This finding is corroborated by results of previous research and suggests that intensive fire prevention efforts should be addressed to preschool children. Since these children are not exposed to organized school programs, part of the prevention efforts should be undertaken by parents, babysitters, day care workers, family counselors and pediatricians. Educators and

psychologists who deal with parents and their youngsters should be aware of fire prevention and should include it as an integral part of their work. Authors of child-rearing guides should be encouraged to include information about fire skills, attraction and preventive measures. Such efforts are especially imperative since fire interest and fire-play were found to be more prevalent among young boys than any statistics show.

Fire information gathered in this study indicated that almost all fires set by normal children in the age groups studied were the result of simply playing with matches. Matches-play sometimes result in a fire, mostly depending on chance conditions. Lack of consistent differences between the children who set fires and those who played with matches without setting fires also indicates the importance of playing with matches rather than fire-setting as the focal variable for future research and prevention programs.

Fire knowledge and preparaion for hazard situations of children and parents indicated that many parents were not exposed to any systematic prevention programs. Existing programs should be available to a larger section of the population than is presently done. With the tremendous effort and resources that are being channeled in this direction , future development and application of fire prevention programs holds the promise of reaching most members of the society, adults and future adults alike.

Fire attraction was found to be independent of fire competence and fire avoidance. This finding suggests the practical impossibility of solving the children fire problem by focussing on preventive measures

while ignoring the curiosity and fascination attached to fire. As previously suggested, "concentration on the prohibitions may well heighten interest and stimulate experimental play" (Block & Block, 1975, p.118). Hence, prevention efforts should pay more attention to the satiation of fire interest by allowing the children to take part in a variety of fire situations which normally occur in the home and by discussing with the children the details of potential hazards, procedures for preventions and actions needed to cope with hazards once they occur.

Children who played with matches were not found to be inferior to their non-playing peers in any of the cognitive or fire knowledge variables. Most of the matches-players were aware to the potential hazard involved in their behavior and to the fact that this behavior is forbidden. These results imply that prevention programs should include training of actual behaviors in addition to transmission of cognitive verbal information. The behavior should focus on appropriate handling of fire as well as on appropriate reactions for hazardous fire situations once they occur.

The lack of relations between the cognitive and behavioral fire variables also suggest that existing fire prevention programs should incorporate behavioral measures in their assessment procedure. Such measures will provide information as to the effectiveness of educational programs on actual decrease of the prevalence of fire-setting.

Boys who were involved in fire-play were also found to be involved in accidents resulting from hazardous play. They were found to be more mischievous, disobedient, aggressive and impulsive. These boys were not

only highly active and energetic but lack impulse control in line with the "rascality" behavioral pattern. Bearing in mind that most of these children seek activity and engage repeatedly in exploring their environment, prohibitive measures are not the surest route to fire prevention. The "Don't play with matches" theme does not seem to be a plausible solution for these children, and may be replaced with the "Use matches safely" theme. Children who develop interest in fire may be provided with controlled experimentation and direction about the safe use of fire within established constraints and with information about appropriate reactions in times of hazard. This suggestion is not as revolutionary as it may seem to many fire prevention specialists, parents and teachers. It has already been promoted by both researchers and fire prevention personnel, it has been adopted by the Montessori Educare Inc. in Boston, Massetucetts, and by 25% of the teachers involved in the fire prevention program in the Riverside County Headstart Project (Folkman & Taylor, 1972). Recently the city of Hayward Fire Department won the grand award of the National Fire Protection Association for its Juvenile Fireplayers Program which was judged to be the best of the nation's "Learn not to burn" programs. The program was initiated with the purpose of channeling fire-players curiosity into interest in fire department and fire safety. Later, the program changed its approach by adopting the "Use matches Safely" theme. According to this program children are taught where, when and how to use matches safely. The teaching is done by the parents who are trained by fire specialists. None of the 75 matches-players who were trained in the program were reported to set

fires later. (Fire Inspector Ray Walters - Personal Communications). The present study also showed that children who had supervised fire training were not prone to be involved in hazardous play. In spite of the anecdotal support for "Use Matches Safely" as replacing the "Don't Play with Matches" theme, it is not yet recommended as a common educational practice. The doubt stems from the lack of cause and effect data on the effect of fire training on fire behaviors and about the limitations that it may involve. An example for potential limitation was presented by Block and Block (1975) "Children may construe parental permission to light a fire in the presence of the parent as a blanket permission to use matches outside the context of parental supervision" (p.108). The ongoing survival skills acquisition study tests the effects of the two themes more rigorously in an experimental-control group design with the hope that its results will shed more light on the intricacies of the fire prevention problem and will enhance improvement of prevention programs. Researchers should be encouraged to explore the conditions under which different training methods are effective in fire prevention.

Matches players were found to be frequently embedded in deprived family backgrounds in terms of parental education, occupation, residential area and family relationships. It is hence suggested that special effort should be directed to these children. This finding and the derived implication were suggested by previous studies of fire-setters, however, they are not compatible with the study of normal children reported by Block, Block & Folkman (1976). It is noted that their sample

was skewed toward the upper-middle class, a fact which could account for the discrepancy in the findings.

Playing with matches was not found to be an isolated problem, but rather one which is related to other problem areas in the child's life. Hence, it is recommended that future fire prevention efforts be part of a more general context which is designed to channel the children's energy into constructive directions in socially functional ways. This could be done by structuring the children's environment and by providing them with opportunities for constructive impulse expression via physical activities exploratory plays and development of hobbies. This kind of impulse expression combined with training the children in other survival skills will hopefully enhance their development into becoming active and creative members of society.

Finally, the complexity of the topic of fire prevention suggests that there is need for further research designed to clarify the problem. In addition to the research questions already mentioned, other topics have yet to be studied.

a. Fire skills, fire behaviors and fire knowledge of boys and girls, of different age groups, of different communities and of different environmental backgrounds.

b. Effects of different prevention programs on fire behaviors and knowledge. Prevention programs may be either existing ones or others developed on the basis of learning procedures suggested in various

psychological and educational studies. Cronbach's (1954, Ch.5) discussion of skill acquisition and Spivack and Shure's (1974) social training are example of such available procedures.

c. Fire prevention in the more general context of the interaction between the child's personality characteristics and the psychological components of his environment.

The above implicatins can be briefly summarized in concrete terms:

1. Increase the availabiltity of fire prevention training to more adults and future adults in our society.

2. Develop fire prevention guidance for parents and specialists who deal with young children.

3. Train children in actual preventative behaviors in addition to teaching cognitive knowledge.

4. Allow children constructive channels for expressing their interest in fire.

5. Study the effects of existing preventative programs on actual fire behaviors including fire-skills and fire-play.

6. Compare the effects of the "Don't play with matches" theme to the "Use matches safely" theme in terms of fire knowlege, skills and play.

7. Focus on fire-play rather than on fire-setting as the major variable for future research and prevention efforts.

8. Channel the energy of the "rascals" to other constructive directions not necessarily involving fire, but involving physical activity, exploratory plays and development of hobbies.

9. Direct intensive prevention efforts to children who are embedded in deprived family backgrounds.

10. Study fire variables and the effectiveness of prevention approaches in different populations and social settings and relate them to the general context of socialization research.

11. Study the effects of prevention programs on behavioral as well as cognitive indices.

It is realized that the study opened more questions than it has answered. However, it is a small step in the investigation of the complex issue of fire in normal children. It is hoped that future

cooperation among fire specialists, educators, therapists, teachers, parents and researchers will increase our undestanding of the problem, will decrease the hazardous and agonizing use of fire and will enhance its proper use for joy and delight.

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Table 1

Mean values and intercorrelations of

fire behaviors and age

	Mean	Fear	Competence	Avoidance	Attraction	Caution	Desire to play	Desire to light
Fear	1.8							
Competence	3.2	-.01						
Avoidance	1.9	.21*	.15					
Attraction	3.5	-.20	.14	-.10				
Caution	4.6	.05	.32*	.00	.08			
Desire to play with fire	2.5	-.18	.18	-.09	.42*	-.11		
Desire to light matches	2.8	-.19	.24*	-.02	.32*	-.08	.59*	
Age		-.16	.26*	-.16	.06	.13	.05	.15

* $p < .05$

Table 2

Intercorrelations of fire knowledge, cognitive variables and age

	"Burn"	"Name"	"Function"	"Situations"
Things that burn				
Fire items - name	.34*			
Fire items - function	.37*	.61*		
Fire situations	.27*	.51*	.38*	
Comprehension	.60*	.53*	.46*	.60*
Picture arrangement	.41*	.43*	.56*	.43*
Digit span	.36*	.47*	.39*	.41*
Mazes (number of errors)	.37*	.35*	.28*	.52*
Age	.43*	.59*	.54*	.57*

* $p \leq .05$

Table 3

Means and intercorrelations of evaluations

of fire experiment

	Mean	Support	Responsibility	Competence	Explanation
Support	5.5 (5.8)	(.80*)			
Responsibility	5.6 (6.0)	.45*	(.55*)		
Competence	4.5 (4.9)	.05	.34*	(.32*	
Clarity of explanation	5.3 (5.4)	.35*	.01	-.32*	(.61*)

* $p < .05$

( ) Means of the button sewing task and correlations between the two experimental tasks

Table 4

Mean values of cognitive and knowledge variables for "play" and "non-play" groups

	"Play" Group	"Non-play" Group
Comprehension	22.5 (.11)	21.5 (-.09)
Picture arrangement	4.7 (-.09)	4.8 (.03)
Digit span	8.8 (-.06)	9.0 (.05)
Mazes (number of errors)	10.1 (.09)	7.8 (-.08)

( ) Mean values of standardized scores computed by age groups

Table 5

Mean values of objective personality variables

for "play" and "non-play" groups

	"Play" Group		"Non-Play" Group	
Draw-a-line	30.2	(.07)	26.8	(-.05)
Block Tower (absolute differences)	13.4	(.97)	13.9	(1 .04)
Balloon test (percentage choosing immediate gratification)	57%		73%	
Puzzle test (percentage stopping prior to alloted time)	29%		24%	
Actometer - arm (N = 34,30)	11.8	(-.02)	11.4	(.02)
Actometer - ankle (N = 30,29)	8.3	(-.10)	7.9	(.10)

( ) Mean values of standardized scores computed by age groups

Table 6

Mean values of fire knowledge and behaviors

for "play" and "non-play" groups

	"Play" Group			"Non-play" Group	
Fire knowledge					
Things that burn	17.2	(.17)		16.4	(-.14)
Fire items - name	5.5	(.17)		5.1	(-.14)
Fire items - function	6.3	(.06)		6.1	(-.05)
Fire situations	4.3	(.15)		3.7	(-.13)
Fire behaviors					
Fear	1.7	(-.09)		1.9	(.08)
Competence	3.7	(.26)	*	2.8	(-.22)
Avoidance	2.1	(.14)		1.7	(-.12)
Attraction	4.0	(.29)	*	3.0	(-.25)
Caution	4.2	(-.19)		4.9	(.16)
Desire to play with fire	3.0	(.31)	*	2.1	(-.26)
Desire to light matches	3.4	(.36)		2.3	(-.31)
Fire experiment					
Support	5.1	(-.33)	*	5.9	(.30)
Responsibility	5.6	(.01)		5.6	(-.01)
Competence	5.1	(.38)	*	4.1	(-.34)
Clarity of explanation	4.7	(-.44)		5.8	(.37)

* $p \leq .05$

( ) Mean values of standardized scores computed by age groups

Table 7

Mean values of cognitive, knowledge and objective personality variables for "fire" and "play-only groups

	"Fire" Group		"Play-only" Group
Comprehension	21.4		23.5
Picture arrangement	4.2		5.1
Digit span	8.3		9.2
Mazes (number of errors)	6.2	*	13.2
Draw-a-line	19.8		39.2
Block tower (absolute difference)	17.7		9.6
Balloon test (percentage choosing immediate gratification	74%		71%
Puzzle test (percentage stopping prior to alloted time)	38%		29%
Actometer - arm (N = 11,19)	12.4		9.8
Actometer - ankle (N = 12,17)	7.0		9.2

* $p \leq .05$

Table 10

Mean values of fire knowledge and behaviors

for "supervision" and "never" groups

	"Supervision" Group	"Never" Group
Fire knowledge		
Things that burn	16.8	15.9
Fire items - name	5.6	4.5
Fire items - function	6.4	5.8
Fire situations	4.5	2.8
Fire behaviors		
Fear	1.9	2.0
Competence	3.6	1.8
Avoidance	1.6	1.8
Attraction	2.7	3.3
Caution	5.4	4.3
Desire to play with fire	2.2	2.0
Desire to light matches	2.8	1.8
Fire experiment		
Support	6.4	5.4
Responsibility	6.1	4.9
Competence	4.5	3.5
Clarity of explanation	6.0	5.6

Table 8

Mean values of fire knowledge and behaviors for "fire" and "play only" groups

	"Fire" Group	"Play only" Group
Fire knowledge		
Things that burn	16.8	17.5
Fire items - name	5.3	5.7
Fire items - function	6.0	6.5
Fire situations	4.2	4.3
Fire behaviors		
Fear	2.0	1.5
Competence	3.7	3.8
Avoidance	1.9	2.2
Attraction	4.3	3.8
Caution	3.7	4.7
Desire to play with fire	3.6	2.6
Desire to light matches	3.7	3.2
Fire experiment		
Support	5.0	5.3
Responsibility	5.4	5.6
Competence	5.1	4.5
Clarity of explanation	5.1	4.5

Table 9

Mean values of cognitive, knowledge and objective personality variables for "supervision" and "never" groups

	"Supervision" Group	"Never" Group
Comprehension	22.9	19.8
Picture arrangement	5.2	4.3
Digit span	9.6	8.3
Mazes (number of errors)	5.4	10.7
Draw-a-line	30.8	22.2
Block tower (absolute difference)	10.1	18.4
Balloon test (percentage choosing immediate gratification)	52%	63%
Puzzle test (percentage stopping prior to alloted time)	31%	48%
Actometer - arm (N = 11,23)	13.3	8.9
Actometer - ankle (N = 7,23)	6.9	13.0

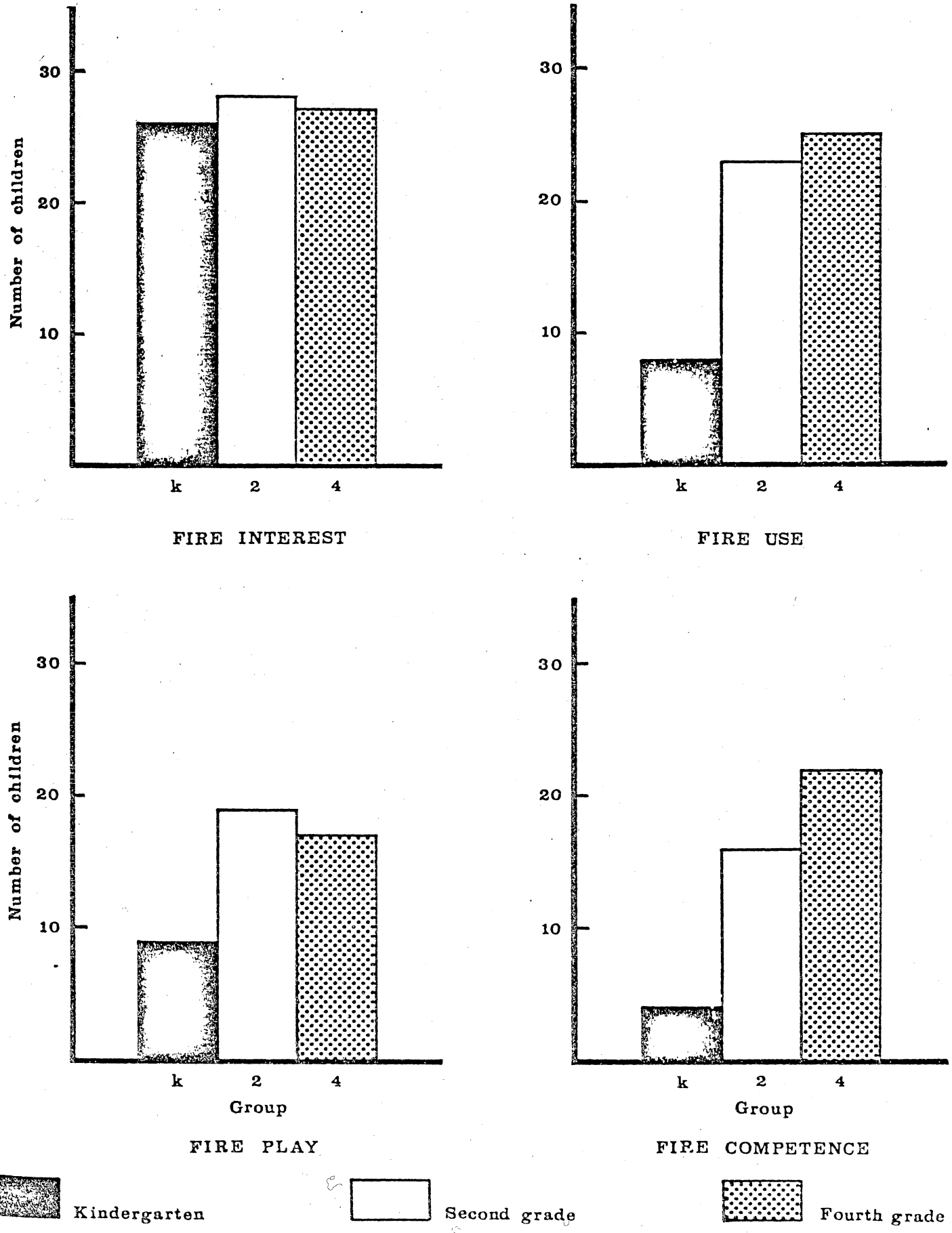

FIGURE 1. Number of children showing different fire behaviors for the three age groups.

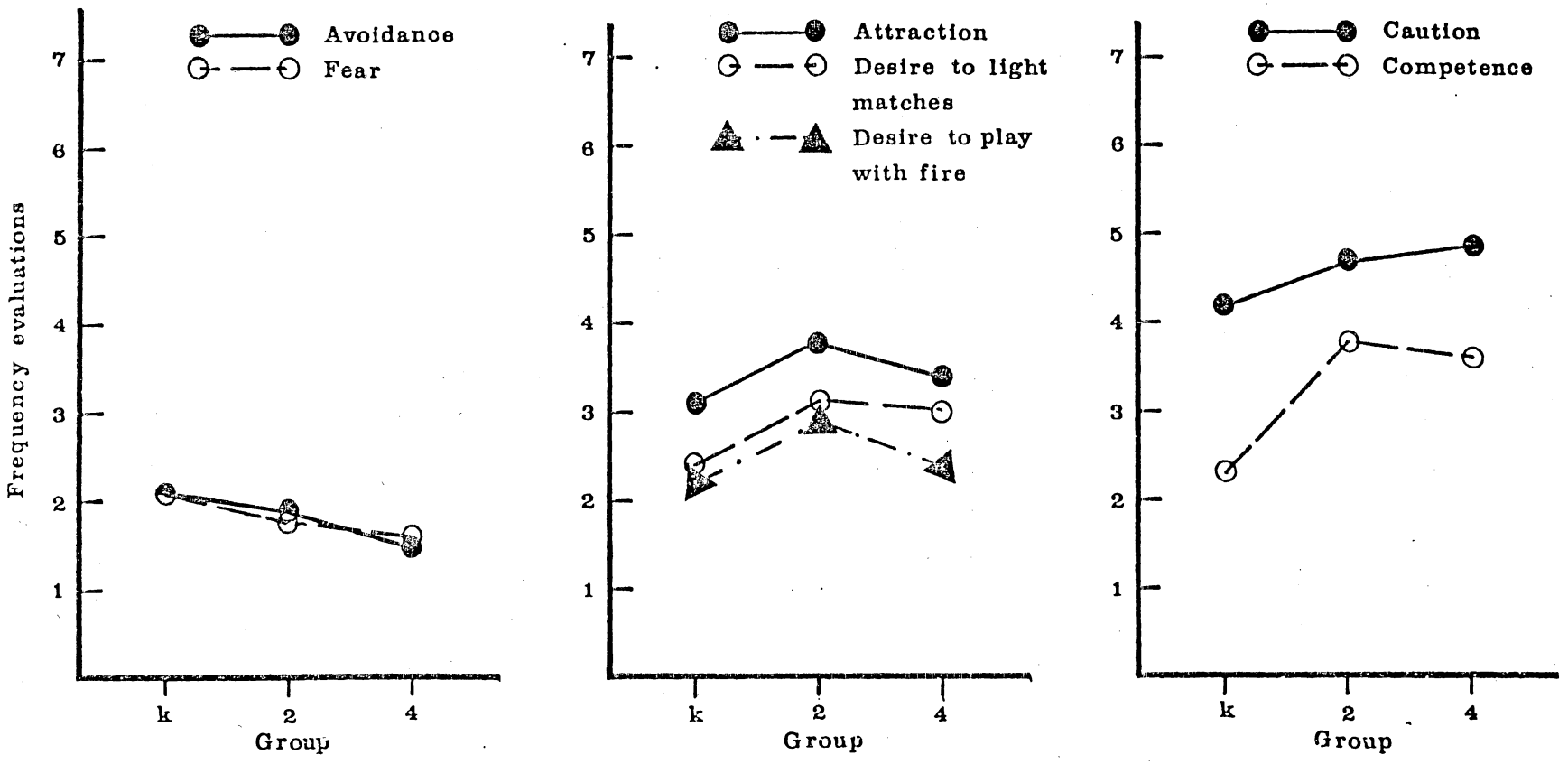

FIGURE 2.

Mean frequency values of mothers' evaluations of different fire behaviors for the three age groups.